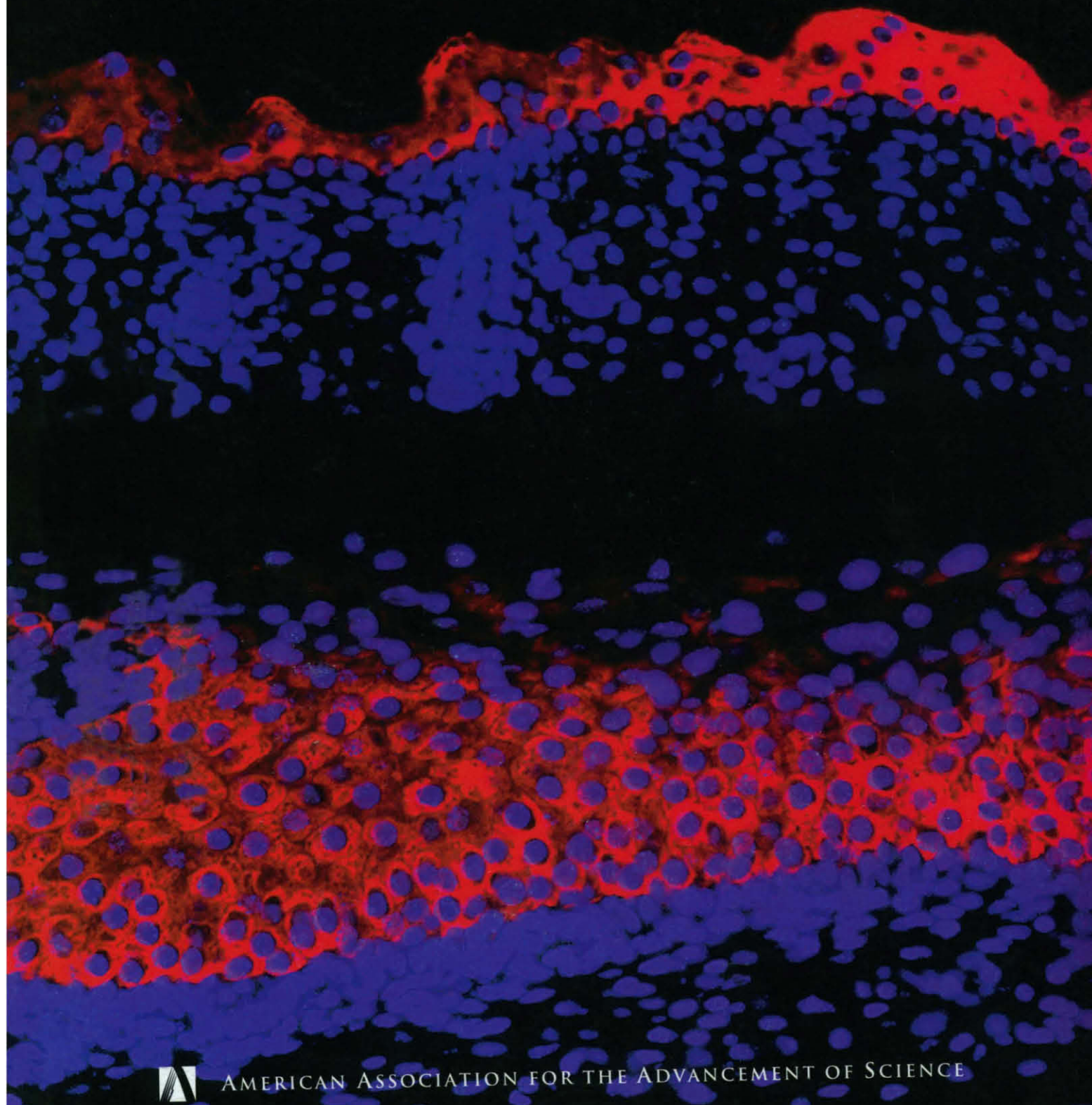


# Science

9 April 1999

Vol. 284 No. 5412  
Pages 213-388 \$8



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



# Take Control of Expression!

## Complete Control<sup>TM</sup>

INDUCIBLE MAMMALIAN EXPRESSION SYSTEM

Now you can have precise, reliable and controlled mammalian gene expression with the Complete Control<sup>TM</sup> inducible mammalian expression system.\* This advanced ecdysone-inducible system combines innovative vector design with the tightest control available to give you a superior method for modulating expression in mammalian cells—without the leaky expression and pleiotropic effects from exogenous inducers that you find in other systems.

- Stable receptor cell lines available to get started quickly
- Optimal expression in a wide variety of tissues and cell lines
- Induction as high as 1,700-fold
- Specific and precise induction

Check out our web site at [www.stratagene.com](http://www.stratagene.com) for all of the details on how you can take control of your experiments today!

#### STRATAGENE USA and CANADA

ORDER: (800) 424-5444 x3  
TECHNICAL SERVICES: 800-894-1304  
FAX: 619-535-0045

#### STRATAGENE EUROPE

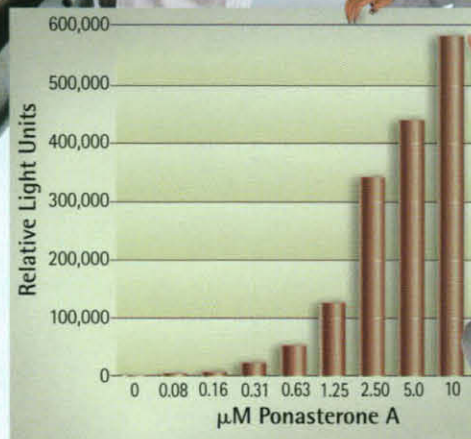
Belgium, Germany, The Netherlands,  
Switzerland, United Kingdom  
ORDER: 00800 7000 7000  
TECHNICAL SERVICES: 00800 7400 7400  
FAX: 00800 7001 7001

#### Austria

ORDER: 0660 312 526  
TECHNICAL SERVICES: 017 956 7036  
FAX: 0660 312 527

#### INTERNET

eMAIL: [techservices@stratagene.com](mailto:techservices@stratagene.com)  
WEBSITE: [www.stratagene.com](http://www.stratagene.com)



Double-stable CHO cells were created by first transfecting and selecting for the pERV receptor vector and then with a pEGSH expression construct containing the luciferase gene. These cells were induced with various amounts of ponasterone A and assayed for luciferase activity.

Circle No. 59 on Readers' Service Card



**STRATAGENE<sup>®</sup>**

[www.stratagene.com](http://www.stratagene.com)

COMPLETE CONTROL<sup>™</sup> VECTOR KIT CAT.#21746B

\* Use of this system by commercial entities requires a commercial license.





## Would you put ketchup in your tea?

Different applications call for different *E. coli* strains. Choose the right one and improve your results.

Invitrogen offers seven different *E. coli* strains in the One Shot™ format so you can choose the strain that best fits your transformation needs. In addition to a great selection of strains, One Shot™ Chemically Competent Cells are provided in single-use aliquots for unmatched convenience and efficiency.

**Easy-to-Use.** One Shot™ Cells are provided in easy-to-use 50 µl aliquots. You can do your transformation right in the tube the cells are provided in. You'll save time because there is no need to thaw and refreeze bulky 200 µl aliquots or transfer cells to a new tube. You'll also save money because you'll never throw away unused cells again.

**High-Efficiency.** One Shot™ transformation efficiencies are as high as  $1 \times 10^9$  cfu/µg of supercoiled DNA. Plus with single-use aliquots, there's no efficiency-zapping freeze-thaw cycles so you'll always get great results.

STRAIN	EFFICIENCY	CAT. NO.
TOP10	$1 \times 10^9$	C4040-03
TOP10F <sup>-</sup>	$1 \times 10^8$	C3030-03
TOP10/P3	$1 \times 10^8$	C5050-03
INVαF <sup>-</sup>	$1 \times 10^8$	C2020-03
NEW INV110	$1 \times 10^6$	C7171-03
BL21(DE3)pLysS	$1 \times 10^8$	C6060-03
NEW BL21(DE3)pLysE	$1 \times 10^7$	C6565-03

Each One Shot™ Kit includes 20 x 50 µl aliquots of competent cells, BME, SOC medium, and a control plasmid.

**Choose the Right Strain.** One Shot™ Chemically Competent Cells are the most convenient, efficient way to transform. And with seven strains to choose from, there's sure to be one that's right for your needs. To find out more about One Shot™ Cells, give Invitrogen a call today. Unless, of course, you like honey on your french fries...

Circle No. 47 on Readers' Service Card

**European Headquarters:**  
Invitrogen BV  
P.O. Box 2312  
9704 CH Groningen  
The Netherlands  
Tel: +31 (0) 50 5299 299  
Fax: +31 (0) 50 5299 281  
Email: tech\_service@invitrogen.nl  
www.invitrogen.com  
See us in booth  
#1232 at AACR

**International Toll Free Numbers:**  
Tel: 00800 5345 5345\*  
Fax: 00800 7890 7890\*  
\*This number operates in all  
European countries excluding  
Finland and Sweden  
**Finland:**  
Tel: 990800 5345 5345  
Fax: 990800 7890 7890  
**Sweden:**  
Tel: 009800 5345 5345  
Fax: 009800 7890 7890

**Distributors:**  
Austria 0222 889 18 19  
Australia 1 800 882 555  
China 010 6255 3477  
Hungary 01 280 3728  
India 91 80 8391453  
Israel 02 584 1111  
Italy 02 38 19 51  
Japan 03 5684 1622

Malaysia 03 432 1357  
Poland 058 341 47 26  
Portugal 01 453 7085  
Singapore 65 2922130  
South Korea 02 569 6902  
Spain 03 450 2601  
Taiwan 886 2 238 10844  
Thailand 246 7243

From all other countries, call  
our European headquarters at  
+31 (0) 50 5299 299.

**United States Headquarters:**

**Invitrogen**

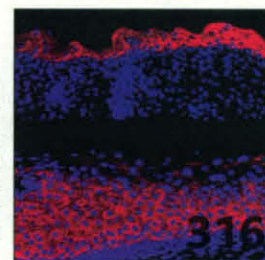
1600 Faraday Avenue  
Carlsbad, California 92008  
Tel: 1-800-955-6288  
Fax: 760-603-7201  
Email: tech\_service@invitrogen.com  
http://www.invitrogen.com



# Science

www.sciencemag.org

**COVER** The I $\kappa$ B kinase (IKK) complex is responsible for triggering inflammatory responses. However, gene ablation experiments have identified an unexpected function for the IKK $\alpha$  subunit of this complex—control of epidermis formation. Sections of epidermis (~30  $\mu$ m tall) from normal (top) and IKK $\alpha$ -deficient mice (bottom) stained to visualize nuclei (purple) and nondifferentiated cells (red) reveal the marked expansion of nondifferentiated cells in mutant epidermis. [Image: Y. L. Hu]



241

Arctic climate oscillator

## NEWS

### NEWS OF THE WEEK

- 230 IMMUNOLOGY: Alternatives to Animals Urged for Producing Antibodies
- ▼ 230 HUMAN EVOLUTION: Forming the Robust  
301 Australopithecine Face
- 231 COLUMBIA UNIVERSITY: Earth Institute Director Bows Out
- 233 JAPAN: New Career Path Seen for Young Scientists
- ▼ 234 METEOROLOGY: Link Between Sunspots,  
305 Stratosphere Buoyed
- 235 ACOUSTICS: Miniaturizing the Mike, in Silicon
- 237 FISHERY MANAGEMENT: Plan Would Protect New England Coast

### NEWS FOCUS

- 238 PSYCHOPHARMACOLOGY: Can the Placebo Be the Cure?  
Drug Therapies for Depression: From MAO Inhibitors to Substance P
- 241 ATMOSPHERE: A New Force in High-Latitude Climate
- 243 AMERICAN CHEMICAL SOCIETY: Chemists Mix It Up in California
- 245 AVALANCHE RESEARCH: Computer Models Aim to Keep Ahead of Snowslides
- 247 ECOLOGY: The *Exxon Valdez*'s Scientific Gold Rush
- 249 GENE ENGINEERING: EPA, Critics Soften Stance on Pesticidal Plants

## DEPARTMENTS

NETWATCH  
219

THIS WEEK IN  
SCIENCE  
221

SCIENCESCOPE  
233

RANDOM SAMPLES  
251

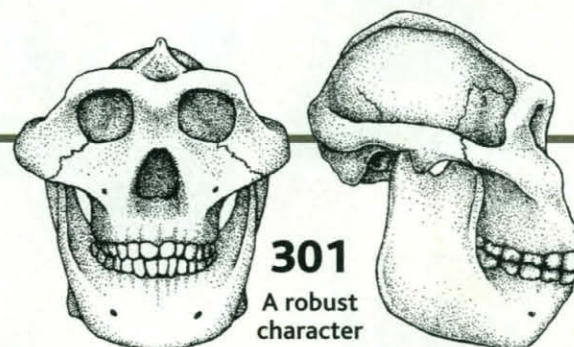
CONTACT SCIENCE  
259

NEW PRODUCTS  
349

## RESEARCH

### REPORTS

- ▼ 289 Digital Logic Gate Using Quantum-Dot  
274 Cellular Automata I. Amlani, A. O. Orlov, G. Toth, G. H. Bernstein, C. S. Lent, G. L. Snider
- 291 Remote Triggering of Waves in an Electrochemical System J. Christoph, P. Strasser, M. Eiswirth, G. Ertl
- 293 Electrodeposited Ceramic Single Crystals J. A. Switzer, M. G. Shumsky, E. W. Bohannon
- ▼ 296 The Fermionic Hanbury Brown and Twiss  
275 Experiment M. Henny, S. Oberholzer, C.  
299 Strunk, T. Heinzl, K. Ensslin, M. Holland, C. Schönenberger
- ▼ 299 Hanbury Brown and Twiss-Type  
275 Experiment with Electrons W. D. Oliver, J.  
296 Kim, R. C. Liu, Y. Yamamoto
- ▼ 301 The Robust Australopithecine Face: A  
230 Morphogenetic Perspective M. A. McCollum



301

A robust character

- ▼ 305 Solar Cycle Variability, Ozone, and  
234 Climate D. Shindell, D. Rind, N. Balachandran, J. Lean, P. Lonergan
- ▼ 309 Positive and Negative Regulation of I $\kappa$ B  
271, 313 Kinase Activity Through IKK $\beta$  Subunit  
316, 321 Phosphorylation M. Delhase, M. Hayakawa, Y. Chen, M. Karin
- ▼ 313 Limb and Skin Abnormalities in Mice  
271, 309 Lacking IKK $\alpha$  K. Takeda, O. Takeuchi, T. Tsujimura, S. Itami, O. Adachi, T. Kawai, H. Sanjo, K. Yoshikawa, N. Terada, S. Akira



AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals Mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 1999 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$110 (\$62 allocated to subscription). Domestic institutional subscription (51 issues): \$325; Foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$90. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. Publications Mail Agreement Number 1069624. Printed in the U.S.A.



## SCIENCE'S COMPASS

### EDITORIAL

- 259 **Foundations and Science Policy**  
D. A. Hamburg

### LETTERS

- 261 **Public Openness** D. Sarewitz. **Tired Old Clichés?** H. R. Soule. **Interdisciplinary Research at EPA** N. E. Noonan. **Response** N. Metzger and R. N. Zare. **C. elegans as a Model** P. H. Silverman. **Hot Zones** C. H. Fox. **U.S. Emission Permit System** J. Coggins and V. W. Ruttan. **Corrections and Clarifications**

### POLICY FORUM

- 267 **HEALTH CARE DELIVERY: Building Population Genetics Resources Using the U.K. NHS** R. Fears and G. Poste

### BOOKS ET AL.

- 269 **IMMUNOLOGY: The Generation of Diversity** *Clonal Selection Theory and the Rise of Molecular Immunology* S. H. Podulsky and A. I. Tauber, reviewed by I. R. Mackay
- 270 **Browsings**



278

Sustaining common-pool resources

### PERSPECTIVES

- ▼ 271 **SIGNAL TRANSDUCTION: IκB Kinases: Kinsmen with Different Crafts** M. J. May and S. Ghosh  
309, 313  
316, 321
- ▼ 274 **NANOTECHNOLOGY: Computation Without Current** C. G. Smith  
289
- ▼ 275 **ELECTRON STATISTICAL EFFECTS: Bunches of Photons—Antibunches of Electrons** M. Büttiker  
296  
299
- ▼ 276 **ECOLOGY: Heeding the Warning in Biodiversity's Basic Law** M. L. Rosenzweig  
334
- 278 **SUSTAINABILITY: Revisiting the Commons: Local Lessons, Global Challenges** E. Ostrom, J. Burger, C. B. Field, R. B. Norgaard, D. Policansky

### REVIEW

SCIENCE ONLINE  
www.scienceonline.org

SCIENCE  
THE JOURNAL  
www.sciencemag.org

SCIENCENOW  
DAILY NEWS SERVICE  
www.sciencenow.org

NEXT WAVE  
WEEKLY CAREER UPDATES  
www.nextwave.org

GRANTSNET  
RESEARCH FUNDING DATABASE  
www.grantsnet.org

NEUROAIDS  
EXPERIMENTAL WEB SITE  
www.sciencemag.org/NAIDS

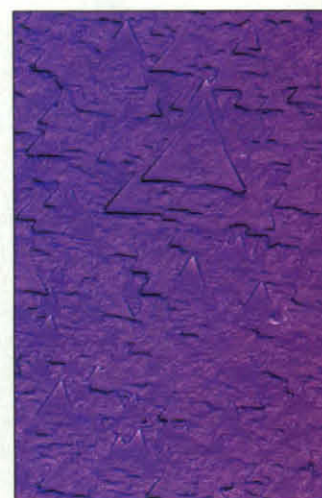
- ▼ 316 **Abnormal Morphogenesis But Intact IKK Activation in Mice Lacking the IKKα Subunit of IκB Kinase** Y. Hu, V. Baud, M. Delhase, P. Zhang, T. Deerinck, M. Ellisman, R. Johnson, M. Karin  
271, 309  
313, 321
- ▼ 321 **Severe Liver Degeneration in Mice Lacking the IκB Kinase 2 Gene** Q. Li, D. Van Antwerp, F. Mercurio, K.-F. Lee, I. M. Verma  
271, 309  
313, 316
- 325 **Evolution of a Protein Fold in Vitro** M. H. J. Cordes, N. P. Walsh, C. J. McKnight, R. T. Sauer
- 328 **The Pex16p Homolog SSE1 and Storage Organelle Formation in Arabidopsis Seeds** Y. Lin, L. Sun, L. V. Nguyen, R. A. Rachubinski, H. M. Goodman
- 330 **Regulation of Maternal Behavior and Offspring Growth by Paternally Expressed Peg3** L.-L. Li, E. B. Keverne, S. A. Aparicio, F. Ishino, S. C. Barton, M. A. Surani

- ▼ 334 **Self-Similarity in the Distribution and Abundance of Species** J. Harte, A. Kinzig, J. Green  
276
- 336 **NMDA Receptor-Mediated K<sup>+</sup> Efflux and Neuronal Apoptosis** S. P. Yu, C.-H. Yeh, U. Strasser, M. Tian, D. W. Choi
- 339 **Ca<sup>2+</sup>-Induced Apoptosis Through Calcineurin Dephosphorylation of BAD** H.-G. Wang, N. Pathan, I. M. Ethell, S. Krajewski, Y. Yamaguchi, F. Shibasaki, F. McKeon, T. Bobo, T. F. Franke, J. C. Reed

### TECHNICAL COMMENTS

**CCR5 Promoter Alleles and Specific DNA Binding Factors** J. H. Bream, H. A. Young, N. Rice, M. P. Martin, M. W. Smith, M. Carrington, S. J. O'Brien

www.sciencemag.org/cgi/content/full/284/5412/223a



293

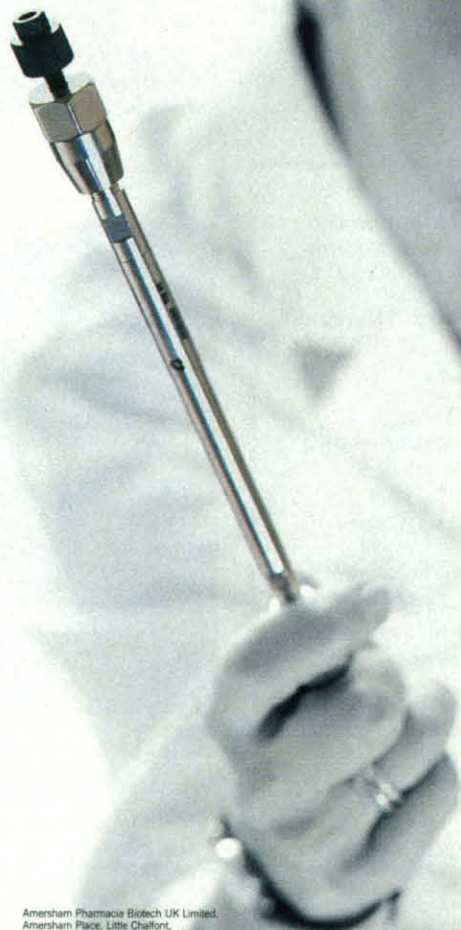
A cooler route to ceramics

Change of address: allow 4 weeks, giving old and new addresses and 8-digit account number. Postmaster: Send change of address to *Science*, P.O. Box 1811, Danbury, CT 06813-1811. Single copy sales: \$8.00 per issue prepaid includes surface postage; bulk rates on request. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$4.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for *Science* is 0036-8075/83 \$4.00. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.



# How many RPC columns give you high-resolution results at any pH?

MMC 33-98



## Only one. **SOURCE™ 5RPC ST 4.6/150**

Do you have trouble with protein fragments or peptides that don't dissolve at low pH? Or will they go into solution but won't separate? SOURCE 5RPC ST 4.6/150 pre-packed, stainless steel column separates your sample at any pH.

The monosized beads ensure high performance, superior resolution and column-to-column reproducibility, run after run. No other column can save you time and money like this.

SOURCE 5RPC is part of our range of complete chromatography solutions which includes ÄKTA™ design systems. For your free start-up kit or more information, visit our web site at [www.apbiotech.com/SOURCE5RPC](http://www.apbiotech.com/SOURCE5RPC)

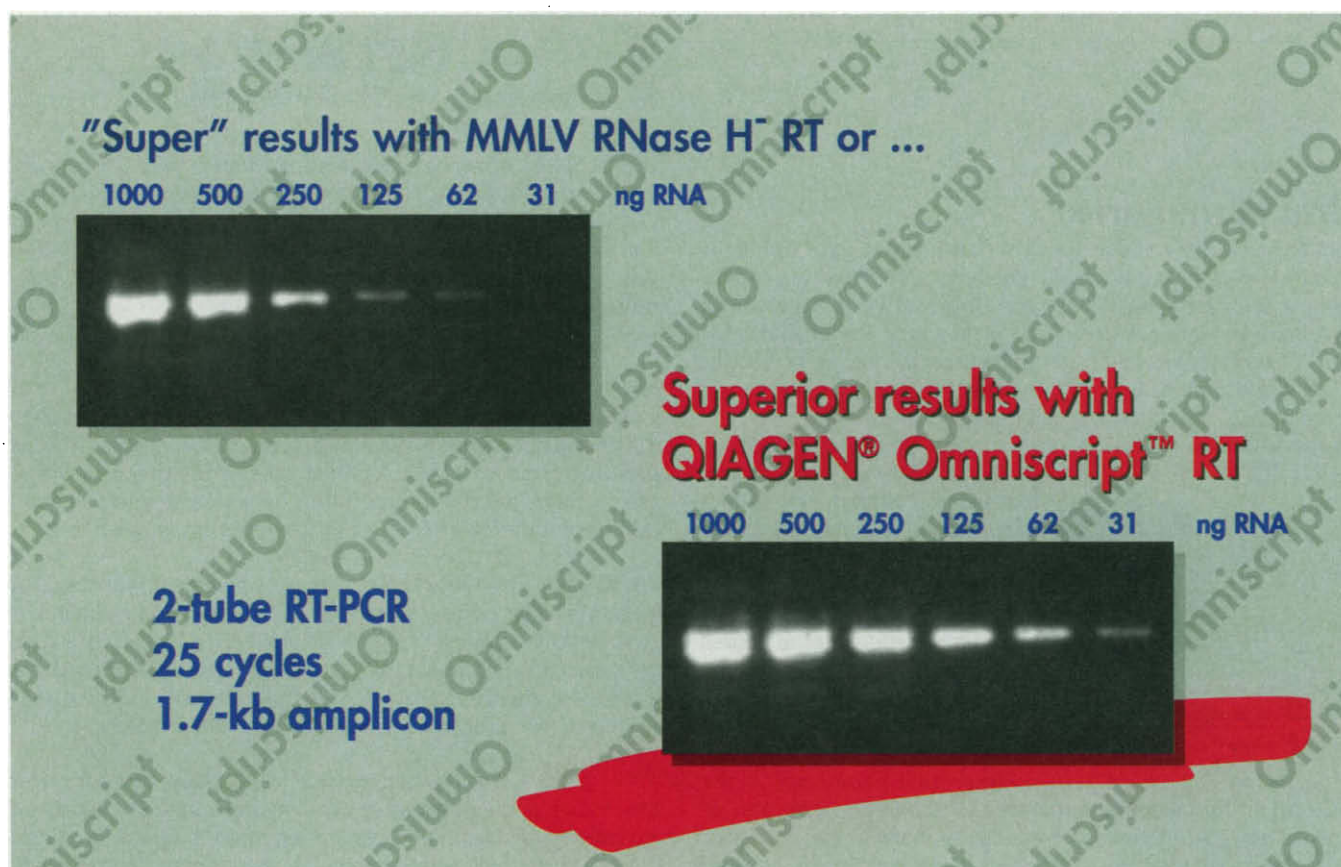
Amersham Pharmacia Biotech UK Limited.  
Amersham Place, Little Chalfont,  
Buckinghamshire, England HP7 9NA.



*amersham pharmacia biotech*

Circle No. 55 on Readers' Service Card





# Use QIAGEN® Omniscript™ RT

for increased efficiency, higher sensitivity, and greater reproducibility!

## Efficiency

Go for significantly increased reverse-transcription efficiency compared to other enzymes

## Sensitivity

Consistently detect low copy numbers of RNA molecules or picogram amounts of RNA



## Reproducibility

Achieve greater reproducibility with the precisely quality-controlled Omniscript RT Kit

## Wide dynamic range

Obtain reliable results over a wide range of starting RNA amounts — with minimal optimization

**Try Omniscript RT yourself and see the difference!**

**Take advantage of the introductory offer by calling 800-426-8157 today!**

Circle No. 57 on Readers' Service Card

<http://www.qiagen.com>

Germany: QIAGEN GmbH  
Tel. 02103-8922-240  
Fax 02103-8922-255

USA: QIAGEN Inc.  
Tel. 800-426-8157  
Fax 800-718-2056

Australia: QIAGEN Pty Ltd  
Tel. 03-9489-3666  
Fax 03-9489-3888

Canada: QIAGEN Inc.  
Tel. 800-572-9613  
Fax 800-713-5951

France: QIAGEN S. A.  
Tel. 01-60-920-930  
Fax 01-60-920-925

Japan: QIAGEN K.K.  
Tel. 03-5805-7261  
Fax 03-5805-7263

Switzerland: QIAGEN AG  
Tel. 061-319-3031  
Fax 061-319-3033

UK: QIAGEN Ltd.  
Tel. 01293-422-999  
Fax 01293-422-922

DISTRIBUTORS: Austria/Hungary/Slovenia Austria (01) 889 18 19 Belgium/Luxembourg 0800-1-9815 Brazil (11) 543 1455 or 0800 55 1321 Central & South America USA (305) 828-3818 China (852)2896-6283 Czech Republic (02)4447 1239 Denmark 43 86 87 88 Finland (09)-804 551 Greece (01)-643 61 38 India (011)-542 1714 Israel 02. 584 1111 Italy (055) 500 1871 Korea (02) 924-86 97 Malaysia (03)-7312099 Mexico USA (661) 294-7940 The Netherlands (033)-4950094 New Zealand (09)980-6700 or 0800-933 966 Norway 22 90 00 00 Poland (071) 351 41 06 or 351 54 20 Portugal (11)-751 6000 Singapore 445 7927 Slovak Republic (07) 54 01 336 South Africa (021) 615166 Spain (93) 902.20.30.90 Sweden (08) 621 34 00 Taiwan (02) 2880 2913 Thailand (02) 412-5672 In other countries contact: QIAGEN GmbH, Germany





## TINY SWITCH

As the demand for faster computers with larger memory grows, there is a need to reduce the size of the devices that perform logic operations. However, the extent to which the dimensions of transistors can be reduced and operate conventionally is limited by leakage currents. One approach for creating nanometer-scale devices is to make use of properties other than charge. Amlani *et al.* (p. 289; see the Perspective by Smith) demonstrate one such approach based on quantum-dot cellular automata, in which polarization and not charge determines the state of the device. Logical AND and OR gates were fabricated whose state at very low temperatures was determined by the position of just two electrons.

## DON'T CROWD THE FERMIONS

Particles that obey Bose-Einstein statistics (such as photons) can occupy the same energy level—bosons like to be together. More than 40 years ago, Hanbury Brown and Twiss demonstrated experimentally one of the fundamental properties of these particles: When they are emitted from a thermal boson source, they do so in bunches (see the Perspective by Büttiker). Henny *et al.* (p. 296) and Oliver *et al.* (p. 299) now verify in two different and independent experiments that, in contrast to the bosons, particles obeying Fermi-Dirac statistics (such as electrons) exhibit antibunching. This behavior was predicted theoretically, but up to now had evaded experimental verification.

## COOLER CERAMIC SYNTHESIS

For many device applications, single-crystal films or materials are favored because the grain boundaries of polycrystalline materials adversely affect their properties. Switzer *et al.* (p. 293) show that electrochemical methods can produce single-crystal films of cubic bismuth oxide at room temperature on gold substrates. This material, which has excellent ion transport properties for fuel cell applications, is normally unstable below 730° Celsius and is formed as a kinetically stabilized product.

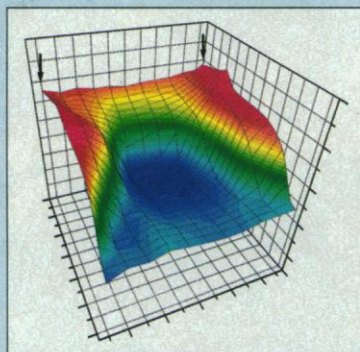
## ABOUT FACE

Hominid phylogenies are defined in many cases by differences in characters of the face and cranium (the most commonly preserved and diagnostic fossils). McCollum (p. 301; see the news story by Morell) examines, for the case of the ro-

bust australopithecines (an enigmatic group of hominid fossils), the degree to which many of these characters can be attributed to relatively simple changes in dental proportions that have a developmental basis. Thus, the cladistic "definition" of this group may not be indicative of the phylogeny.

## WAVING IN THE DISTANCE

When waves are triggered in a medium—by throwing stones in a pond or sending electrical impulses to the heart—they usually emanate from the point of stimulation. Christoph *et al.* (p. 289) describe an electrochemical system where triggering initiates a



wave at a point distant from the trigger. The oxidation of formic acid at platinum electrodes has passive (OH<sup>-</sup>-poisoned) and active (high current) states, and an appropriate voltage pulse can initiate two circularly traveling wave fronts that activate the passive state. However, a pulse of an opposite sign, which might be expected to reinforce the passive state, instead initiated activation waves but from a point opposite the trigger pulse. Such action at a distance occurs because the coupling function for ion migration that allows wave propagation reverses its sign at longer distances.

## SOLAR CASCADE

Several climate indices and environmental or ecological phenomena show an approximate 11-year cycle that seems to be similar to the solar cycle. However, the irradiance change associated with the solar cycle is very weak, so it has been very difficult to demonstrate a mechanistic connection. Shindell *et al.* (p. 305; see the news story by Kerr) now show, using a climate model that in-

cludes ozone variability and wavelength-dependent irradiance, that the solar cycle may have an effect on tropospheric climate. The connection is that changes in stratospheric ozone abundance, driven by the solar irradiance cycle, may affect stratospheric circulation, which affects tropospheric energy and thus regional surface temperatures.

## LEAVING THE FOLD

Protein structures usually react to single mutations by relatively small adjustments in their structure; significant changes to secondary and tertiary structural elements are generally believed to require more severe sequence changes, such as large insertions or deletions. Cordes *et al.* (p. 325) show that in the small Arc repressor protein dimer, a switch between just two residues results in a local change from a  $\beta$ -sheet to a helical structure. Within the constraints imposed by the connectivity between the secondary structure elements, such a change can be understood from the sequence pattern. Even relatively small numbers of mutations can thus alter a protein fold.

## CONTROLLING NF- $\kappa$ B

The activity of NF- $\kappa$ B, a master transcription factor for many genes essential for inflammatory and immune responses, is held in check by inhibitory proteins known as I $\kappa$ Bs. In cells exposed to tumor necrosis factor (TNF) or interleukin-1 (IL-1), I $\kappa$ Bs are phosphorylated and degraded. The phosphorylation of I $\kappa$ Bs is thought to be mediated by I $\kappa$ B kinase complexes that include similar IKK $\alpha$  and IKK $\beta$  (or IKK1 and IKK2) protein kinase subunits. Four reports, which describe the phenotypes of mice that lack either IKK $\alpha$  or IKK $\beta$ , provide new insight into the physiological roles of these enzymes. Li *et al.* (p. 321) show that cells from mice lacking IKK $\beta$  indeed have reductions in the responsiveness of NF- $\kappa$ B to TNF and IL-1. The mice themselves die before birth because of increased apoptosis in the liver. Loss of IKK $\alpha$ , however, produced a quite distinct phenotype. Hu *et al.* (p. 316) and Takeda *et al.* (p. 313) find that these mice die shortly after birth and show abnormalities in proliferation and development of skin and in morphogenesis of the limbs and skeleton. In cells from mice lacking IKK $\beta$ , activation of NF- $\kappa$ B in response to TNF and IL-1 remained intact. Delhase *et al.* (p. 309) provide additional evidence that IKK $\alpha$  is the enzyme that mediates signaling from TNF- $\alpha$  and IL-1

CONTINUED ON PAGE 223



ARE YOU FACING

certain  
death

WITH

YOUR

TUNEL

PROVIDER?

**E**xpertise pays off. At a time when other TUNEL providers are dying out, one is flourishing. Only Roche Molecular Biochemicals offers a complete line of innovative apoptosis research reagents, including the Caspase 3 Activity Assay, Cell Death Detection ELISA<sup>PLUS</sup>, and the new M30 CytoDEATH antibody.

Don't let your apoptosis research die with your reagent provider. Order your TUNEL reagents from Roche Molecular Biochemicals, your apoptosis specialists.

**Roche**

Internet: <http://biochem.roche.com> Apoptosis web site: <http://biochem.roche.com/techserv/apoptosis>  
Orders: 800 262 1640 Technical: 800 262 4911 Canada: (450) 686 7050; (800) 361 2070

Circle No. 69 on Readers' Service Card



## THIS WEEK IN SCIENCE

CONTINUED FROM PAGE 221

from an analysis of mutant forms of the IKKs that lack sites for activation by phosphorylation. Furthermore, their results indicate that IKK $\beta$  may be inactivated through autophosphorylation of a cluster of serine residues at the carboxyl terminus of the protein, thus limiting the duration of inflammatory signaling. In a Perspective, May and Ghosh outline the current understanding of the signaling mechanisms that control activity of NF- $\kappa$ B in light of the findings that define distinct biological roles for IKK $\beta$ .

### BALANCING NUTRITION

Plant seeds contain stored protein, lipid, and starch in various combinations that contribute to that seed's value as a food or oil source. Lin *et al.* (p. 328) identified a protein, SSE1, in the small oilseed plant *Arabidopsis*, and found that mutations in SSE1 can disrupt the storage of protein and lipid in favor of starch. Thus, the diverse metabolic pathways that assemble the storage materials are intricately interlinked, and the ultimate balance of components may be amenable to readjustment.

### DADS AND DAUGHTERS

In mammals, although each parent contributes genetic material to its offspring, parent-specific genomic imprinting allows for the favored expression of one parent's allelic contribution over the other. Li *et al.* (p. 330) examined the imprinted mouse gene *Peg3*. Although this gene is expressed exclusively from the paternal allele, it is responsible for regulating maternal behavior, nurturing, and growth of the offspring. Mutation of *Peg3* yielded a decreased level of oxytocin neurons. Because oxytocin has been shown previously to affect maternal nurturing and lactation, the regulation of maternal behavior by the paternally expressed gene *Peg3* is now better understood physiologically.

### TECHNICAL COMMENT SUMMARIES

#### CCR5 Promoter Alleles and Specific DNA Binding Factors

M. P. Martin *et al.* (Reports, 4 Dec., p. 1907) performed "genetic association analysis of five cohorts of people with acquired immunodeficiency syndrome (AIDS) [which] revealed that infected individuals homozygous for a multisite haplotype of the *CCR5* regulatory region containing the promoter allele, *CCR5P1*, progress to AIDS more rapidly than those with other *CCR5* promoter genotypes, particularly in the early years after infection."

J. H. Bream *et al.* (including several co-authors of the original report) comment that they "have found a distinction in specific binding affinity for separate *CCR5P* allele sequence motifs to nuclear binding (potential transcription) factors, which suggests a possible mechanism for *CCR5P1/P1* epidemiologic consequences."

### PATTERNS IN NATURE

Harte *et al.* (p. 334; see the Perspective by Rosenzweig) examine the properties of self-similar populations and communities. They demonstrate that several fundamental ecological generalities—the species-area curve, the species-abundance distribution, and a new area-endemism relation—can be linked conceptually into a single framework. The work also shows that two widely accepted patterns—the lognormal species-abundance distribution and the power-law species-area curve—conflict with one another.

### INJURIOUS IONS

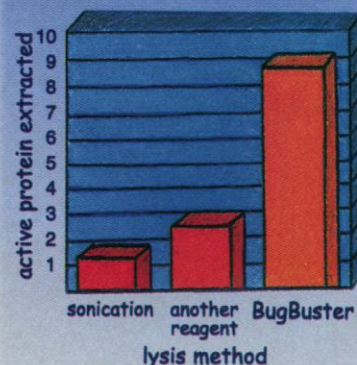
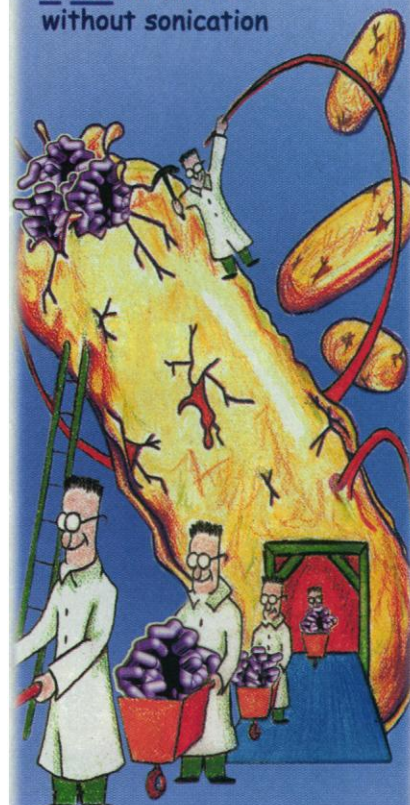
The role that ions play in cell death is the subject of two reports. During stroke, neurons are thought to die in part because of the overactivity of the NMDA class of neurotransmitter receptors. These receptors form channels for a variety of ions, including potassium. Yu *et al.* (p. 336) explored the hypothesis that potassium efflux from cells may contribute to their demise. Under conditions that mimic those found in stroke, cultured neurons were found to undergo apoptosis in response to NMDA-receptor-mediated potassium efflux. One of the classic examples of cells dying an apoptotic death is by calcium influx into neurons, which activates a phosphatase called calcineurin. How calcineurin evokes death has not been clear. Now Wang *et al.* (p. 339) report that calcineurin can associate with and remove an inhibitory phosphate from the pro-apoptotic protein BAD. This process relocates BAD from the cytosol of the neurons into the mitochondria, where it dimerizes with and inactivates the anti-apoptotic protein Bcl-x<sub>L</sub>. Thus, brain insults and conditions that increase Ca<sup>2+</sup> can modulate the phosphorylation state of a key protein in the apoptosis pathway.

The full text of these comments can be seen at [www.sciencemag.org/cgi/content/full/284/5412/223a](http://www.sciencemag.org/cgi/content/full/284/5412/223a)

new  
**BUGBUSTER™**  
protein extraction reagent

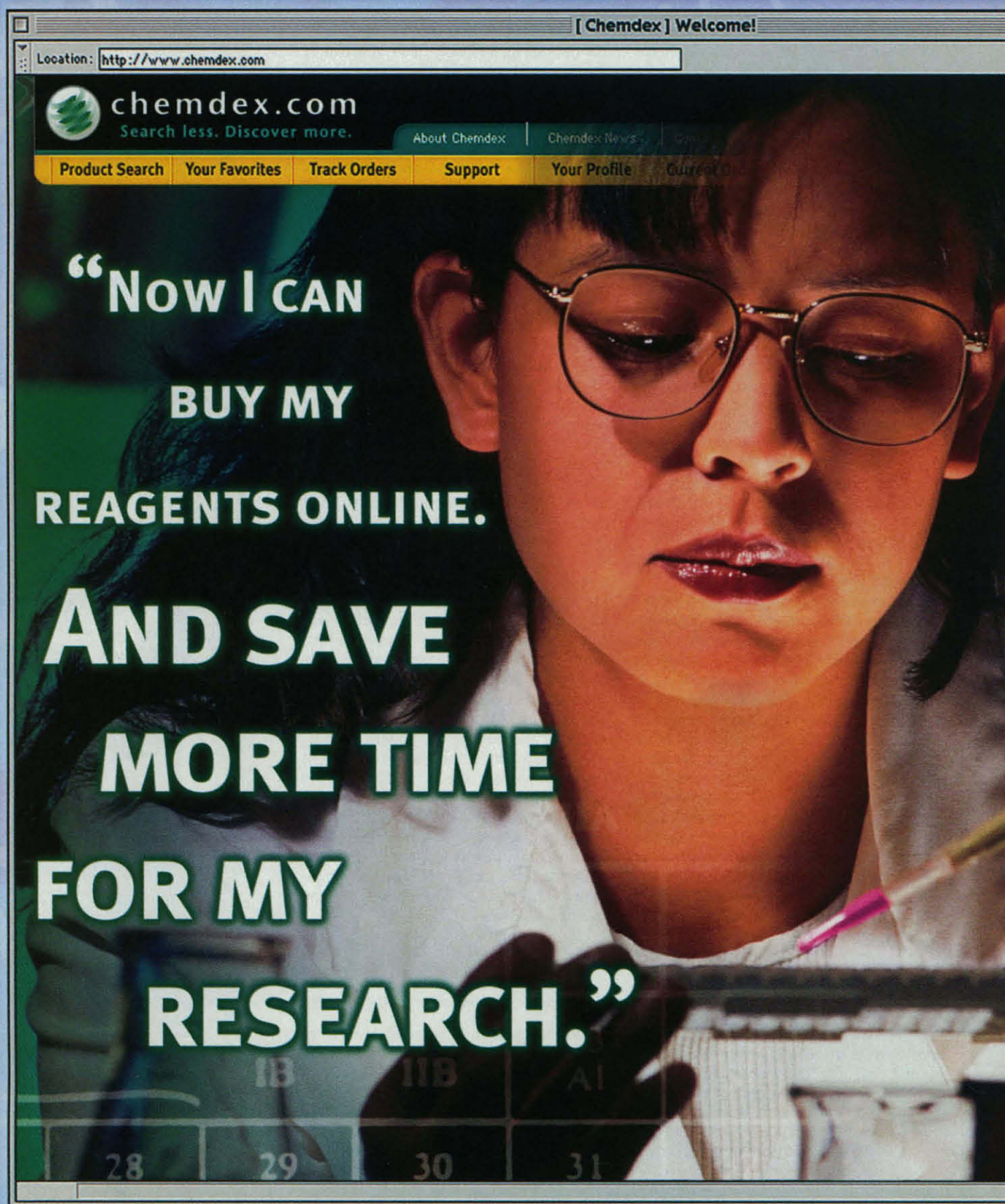
Simple  
Effective

BugBuster is a  
Ready-to-Use  
liquid that extracts  
soluble proteins from  
*E. coli* in minutes  
without sonication



**Novagen®**  
800.526.7319  
[www.novagen.com](http://www.novagen.com)





The background image shows a close-up of a female scientist with dark hair and glasses, wearing a white lab coat. She is holding a pink-tipped pipette and looking down at a multi-well plate. The overall scene is set in a laboratory environment.

**[ Chemdex ] Welcome!**

Location: <http://www.chemdex.com>

**chemdex.com**  
Search less. Discover more.

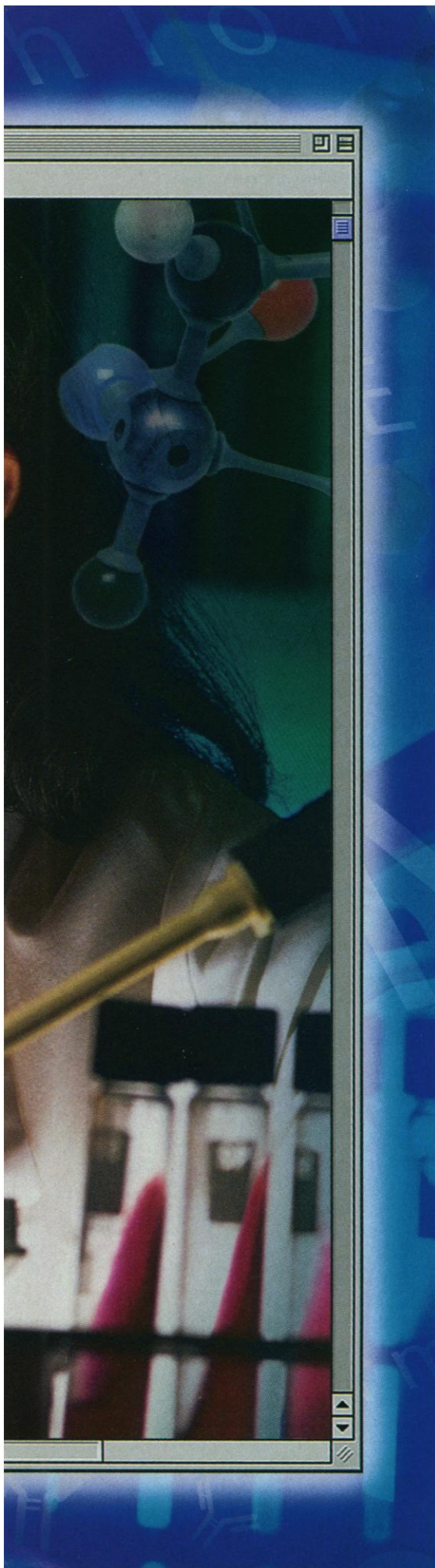
About Chemdex | Chemdex News | Contact Us

Product Search | Your Favorites | Track Orders | Support | Your Profile | Current Orders

**“NOW I CAN  
BUY MY  
REAGENTS ONLINE.  
AND SAVE  
MORE TIME  
FOR MY  
RESEARCH.”**

	IB	IIB	AI
27	28	29	30
C6			31





## **Announcing chemdex.com**

### **The Faster, Easier Way to Purchase Biological and Chemical Reagents.**

---

Spend less time searching for reagents and more time pursuing your research. When you purchase your reagents through chemdex.com, you get:

- The world's largest source of biological and chemical reagents for life science research
- Ordering with the click of a mouse—in a secure environment
- The suppliers you know—and trust
- A powerful, precision search engine to quickly find what you need

**Purchase your reagents faster. Easier. ONLINE.  
At [www.chemdex.com](http://www.chemdex.com).**



## **chemdex.com**

**Search less.  
Discover more.**

Chemdex Corporation • 3950 Fabian Way, Palo Alto, CA 94303 • 650-813-0300  
© 1999 Chemdex Corporation. Chemdex is a registered trademark of Chemdex Corporation.



EDITOR-IN-CHIEF  
**Floyd E. Bloom**

EDITOR  
**Ellis Rubinstein**

MANAGING EDITOR  
**Monica M. Bradford**

#### EDITORIAL

DEPUTY MANAGING EDITORS: Richard B. Gallagher (Biological Sciences), R. Brooks Hanson (Physical Sciences), Katrina L. Keller (Compass); SUPERVISORY SENIOR EDITORS Linda J. Miller, Phillip D. Szuroni; SENIOR EDITORS Gilbert J. Chin, Pamela J. Hines, Barbara Jasny, Paula A. Kiberstis, L. Bryan Ray; ASSOCIATE EDITORS Lisa D. Chong, Beverly A. Purnell, Linda R. Rowan; EDITORIAL SUPPORT Candace Gallery, Carolyn Kyle, Elise Laffman, Patricia M. Moore, Anita Wynn; ADMINISTRATIVE SUPPORT Sylvia Kihara

#### SCIENCE'S COMPASS

SENIOR EDITORS/PERSPECTIVES Orla Smith, Julia Uppenbrink; ASSOCIATE BOOK REVIEW EDITOR Sherman J. Suter; CONTRIBUTING EDITORS

#### PUBLISHER

**Richard S. Nicholson**

ASSOCIATE PUBLISHER  
**Beth Rosner**

MEMBERSHIP/CIRCULATION DIRECTOR  
**Michael Spinella**

#### MEMBERSHIP/CIRCULATION

SUBSCRIPTION SERVICES: 202-326-6417; 800-731-4939  
DEPUTY DIRECTOR Marlene Zendell; MEMBER SERVICES: MANAGER Michael Lung; SUPERVISOR Mary Curry; REPRESENTATIVES Laurie Baker, Pat Butler, Christine Ford, Mari Pope, Jantell Smith; MARKETING: MANAGER Scott Oser; COORDINATOR Lauri Sirois; EUROPE MANAGER Jane Pennington; ASSOCIATE Ruth Jackson; RESEARCH: MANAGER Renuka Chander; BUSINESS AND FINANCE: MANAGER Dwight Theall; ASSISTANT Susan Maxim; COMPUTER SPECIALIST Charles Munson

#### FINANCE AND ADVERTISING

BUSINESS AND FINANCE: BUSINESS MANAGER Deborah Rivera-Wienhold; SENIOR ANALYST Randy Yi; FINANCIAL ANALYST Lisa Donovan RIGHTS AND PERMISSIONS: ASSOCIATE Lincoln Richman; ASSISTANT Emilie David MARKETING: DIRECTOR John Meyers; ASSOCIATE Allison Pritchard ELECTRONIC MEDIA: MANAGER David Gillikin; COMPUTER SPECIALIST Wendy Green; PRODUCTION ASSOCIATES Mark Croatti, Ellen McGuire

Kevin Ahern, Richard Peters, Robert Sikorski, David F. Voss; PUBLICATION ASSISTANTS Brent Gledeman, Jeffrey Hearn; INFORMATION SPECIALIST Janet Kegg; LETTERS AND TECHNICAL COMMENTS: EDITOR Christine Gilbert; ASSOCIATE EDITOR Steven S. Lapham; PUBLICATION ASSISTANT Charlene King

#### NEWS

NEWS EDITOR Colin Norman; FEATURES EDITOR Tim Appenzeller; DEPUTY NEWS EDITORS Elizabeth Culotta (contributing editor), Jean Marx, Jeffrey Mervis, Richard Stone; NEWS WRITERS Martin Enserink, Michael Haggmann (intern), Constance Holden, Jocelyn Kaiser, Richard A. Kerr, Andrew Lawler, David Malakoff, Eliot Marshall, Elizabeth Pennisi, Robert F. Service, Gretchen Vogel BUREAUS: BERKELEY, CA Marcia Barinaga (contributing correspondent); SAN DIEGO, CA Jon Cohen (contributing correspondent); CHICAGO, IL James Glanz; COPY EDITORS Linda B. Felaco, Daniel T. Helgeman; CONTRIBUTING CORRESPONDENTS Barry A. Cipra, Ann Gibbons, Charles C. Mann, Anne Simon Moffat, Virginia Morell, Evelyn Strauss, Gary Taubes, Ingrid Wickelgren; ADMINISTRATIVE SUPPORT Scherraine Mack, Fannie Groom

#### EDITING AND PROOFREADING

DIRECTOR Dawn McCoy; SUPERVISOR Cara Tate; SENIOR COPY EDITORS Cay Butler, Harry Jach, Barbara Ordway, Christine M. Pearce; COPY EDITORS Jeffrey E. Cook, Etta Kavanagh, Jason Llewellyn, Joshua Marcy; COPY DESK Joi S. Granger, Monique Martineau, Ellen E. Murphy, Beverly Shields; ASSISTANT Kathy Libal

#### PRODUCTION

DIRECTOR James Landry; MANAGER Wendy K. Shank; ASSISTANT PRODUCTION MANAGER, INTERN Elizabeth A. Harman; ASSOCIATES Vicki

#### PRODUCT ADVERTISING

NATIONAL SALES MANAGER NORTHEAST AND E. CANADA Richard Teeling: 973-904-9774, FAX 973-904-9701 • MIDWEST/SOUTHEAST Elizabeth Mosko: 773-665-1150, FAX 773-665-2129 • WEST COAST/W. CANADA Neil Boylan: 415-673-9265, FAX 415-673-9267 • MID ATLANTIC AND U.S. INSIDE SALES Christopher Breslin: 410-273-1007, FAX 410-273-1591 • UK/SCANDINAVIA/France/Italy/BELGIUM/NETHERLANDS Andrew Davies: (44) 7-071-226-216, FAX (44) 7-071-226-233 • GERMANY/SWITZERLAND/AUSTRIA Tracey Peers: (44) 1-260-297-530, FAX (44) 1-260-271-022 JAPAN Masahiko Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852 • TRAFFIC MANAGER Carol Maddox; SALES ASSOCIATES Sheila Myers, Sandra Walls; ADMINISTRATIVE SUPPORT Jessica Tierney

#### RECRUITMENT ADVERTISING

SALES AND PRODUCTION OPERATIONS MANAGER Terri Seiter Azie u.s.: SALES MANAGER Gabrielle Boguslawski: 718-491-1607, FAX 202-289-6742; SALES SUPERVISOR Daryl Anderson; SALES REPRESENTATIVES Troy Benitez, Kathleen Clark, Beth Dwyer, Bren Peters-Minnis, Kristin Westapher; ASSISTANTS Erika Bryant, Christina Geiger PRODUCTION: SENIOR ASSOCIATE Jennifer Rankin; ASSOCIATES Chriss Borkowski, Elizabeth Lenox COPY EDITOR/PROOFREADER Chris Filiatreau U.K./EUROPE: SALES MANAGER Debbie Cummings; SALES EXECUTIVE Sabine Lenuid; ASSISTANT Elisabeth Py: (44) 1223-326500, FAX (44) 1223-326532 AUSTRALIA/NEW ZEALAND: Keith Sandell: (61) 02-9922-2977, FAX (61) 02-9922-1100 JAPAN: Masahiko Yoshikawa: (81) 3-3235-5961, FAX (81) 3-3235-5852

#### DEPUTY EDITORS

Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*); Thomas R. Cech (*Biological Sciences*)

#### BOARD OF REVIEWING EDITORS

Frederick W. Alt <i>Children's Hospital, Boston</i>	David Clapham <i>Max Planck Institute of Children's Hospital, Boston</i>	Peter Gruss <i>Max Planck Institute of Biophysical Chemistry</i>	Norman L. Letvin <i>Beth Israel Hospital, Boston</i>	Bert W. O'Malley <i>Baylor College of Medicine</i>	National Taiwan University Tomoyuki Takahashi
Don L. Anderson <i>California Institute of Technology</i>	Adrienne E. Clarke <i>University of Melbourne, Parkville</i>	Philip C. Hanawalt <i>Stanford University</i>	Harvey F. Lodish <i>Whitehead Institute for Biomedical Research</i>	Roy R. Parker <i>University of Arizona, Tucson</i>	University of Tokyo Masatoshi Takeichi
Michael Ashburner <i>University of Cambridge</i>	F. Fleming Crim <i>University of Wisconsin, Madison</i>	Paul Harvey <i>University of Oxford</i>	Richard Losick <i>Harvard University</i>	Stuart L. Pimm <i>The Univ. of Tennessee, Knoxville</i>	Kyoto University Keiji Tanaka
Frank S. Bates <i>Univ. of Minnesota, Minneapolis</i>	Paul J. Crutzen <i>Max-Planck-Institut für Chemie</i>	M. P. Hassell <i>Imperial College at Silwood Park</i>	Seth Marder <i>University of Arizona</i>	Yeshayahu Pocker <i>Univ. of Washington, Seattle</i>	RIKEN Institute David Tilman
Stephen J. Benkovic <i>Pennsylvania State University</i>	James E. Dahlberg <i>University of Wisconsin Medical School, Madison</i>	Nobutaka Hirokawa <i>University of Tokyo</i>	Diane Mathis <i>Institut de Chimie Biologique, Strasbourg</i>	Martin Raff <i>University College London</i>	Univ. of Minnesota, St. Paul Robert T. N. Tjian
Alan Bernstein <i>Mount Sinai Hospital, Toronto</i>	Robert Desimone <i>National Institute of Mental Health, NIH</i>	Tasuku Honjo <i>Kyoto University</i>	Susan K. McConnell <i>Stanford University</i>	Douglas C. Rees <i>California Institute of Technology</i>	Univ. of California, Berkeley Yoshinori Tokura
Michael J. Bevan <i>University of Washington, Seattle</i>	Hans Eklund <i>Swedish Univ. of Agricultural Sciences, Uppsala</i>	Susan D. Iversen <i>University of Oxford</i>	Anthony R. Means <i>Duke University Medical Center</i>	T. M. Rice <i>ETH-Hönggerberg, Zürich</i>	University of Tokyo Derek van der Kooy
Seth Blair <i>University of Wisconsin, Madison</i>	Paul T. Englund <i>Johns Hopkins University School of Medicine</i>	Eric F. Johnson <i>The Scripps Research Institute</i>	Stanley Meisler <i>University of California, Davis</i>	David C. Rubie <i>Universität Bayreuth</i>	University of Toronto Geerat J. Vermeij
David E. Bloom <i>Harvard Institute for International Development</i>	G. Ertl <i>Max-Planck-Gesellschaft</i>	Hans Kende <i>Michigan State University</i>	Douglas A. Melton <i>Harvard University</i>	Erkki Ruoslahti <i>The Burnham Institute, CA</i>	University of California, Davis Bert Vogelstein
Piet Borst <i>The Netherlands Cancer Institute</i>	Richard G. Fairbanks <i>Lamont-Doherty Earth Observatory</i>	Elliott Kleff <i>Harvard University</i>	Andrew Murray <i>Univ. of California, San Francisco</i>	Gottfried Schatz <i>Biozentrum, Basel</i>	Gerhard Wegner <i>Max-Planck-Institut für Polymerforschung</i>
Henry R. Bourne <i>Univ. of California, San Francisco</i>	Douglas T. Fearon <i>University of Cambridge</i>	Jeffrey T. Kiehl <i>National Center for Atmospheric Research, Boulder</i>	Elizabeth G. Nabel <i>The Univ. of Michigan Medical Center</i>	Jozef Schell <i>Max-Planck-Institut für Zuchtungsforschung</i>	Arthur Weiss <i>Univ. of California, San Francisco</i>
James J. Bull <i>University of Texas at Austin</i>	Harry A. Fozzard <i>The University of Chicago</i>	Judith Kimple <i>University of Wisconsin, Madison</i>	Shigetada Nakanishi <i>Kyoto University</i>	Ronald H. Schwartz <i>National Institute of Allergy and Infectious Diseases, NIH</i>	Zena Werb <i>Univ. of California, San Francisco</i>
Kathryn Calame <i>Columbia Univ. College of Physicians &amp; Surgeons</i>	Roger I. M. Glass <i>Centers for Disease Control</i>	Stephen M. Kosslyn <i>Harvard University</i>	Kim Nasmyth <i>Research Institute of Molecular Pathology, Vienna</i>	Terrence J. Sejnowski <i>The Salk Institute</i>	George M. Whitesides <i>Harvard University</i>
Dennis W. Choi <i>Washington Univ. School of Medicine, St. Louis</i>	Peter N. Goodfellow <i>SmithKline Beecham, UK</i>	Michael LaBarbera <i>The University of Chicago</i>	Roger A. Nicoll <i>Univ. of California, San Francisco</i>	Christopher R. Somerville <i>Carnegie Institute of Washington, Stanford, CA</i>	Ian A. Wilson <i>The Scripps Research Institute</i>
Joanne Chory <i>The Salk Institute</i>	Jack F. Greenblatt <i>University of Toronto</i>	Antonio Lanzavecchia <i>Basel Institute for Immunology</i>	Staffan Normark <i>Swedish Institute for Infectious Disease Control</i>	Michael P. Stryker <i>Univ. of California, San Francisco</i>	Alan P. Wolfe <i>National Institute of Child Health and Human Development, NIH</i>
		Nicole Le Douarin <i>Institut d'Embryologie Cellulaire et Moléculaire du CNRS</i>	Kiyotaka Okada <i>Kyoto University</i>	Cliff Tabin <i>Harvard Medical School</i>	Martin Zatz <i>National Institute of Mental Health, NIH</i>

J. Jorgensen, Tara L. Kelly, Jessica K. Moshell, Rebecca Thomas

#### ART

DESIGN DIRECTOR Amy Decker Henry; ART DIRECTOR C. Faber Smith; ASSOCIATE ART DIRECTOR Elizabeth Carroll; SCIENTIFIC ILLUSTRATOR Katharine Sutliff; GRAPHICS ASSOCIATES Holly Bishop, Preston Morrighan, Darcel Pugh, Patricia M. Riehn; PHOTO RESEARCHER Leslie Blizard

#### SCIENCE INTERNATIONAL

##### EUROPE

EDITORIAL OFFICE: HEAD Richard B. Gallagher; ASSOCIATE EDITORS Stella M. Hurltley, Ian S. Osborne, Peter Stern; SCIENCE'S COMPASS: SENIOR EDITOR/PERSPECTIVES Julia Uppenbrink; NEWS: EDITOR Daniel Clery; CONTRIBUTING CORRESPONDENTS Michael Balter (Paris) Robert Koenig (Bern); SCIENCE'S NEXT WAVE, UK EDITOR: John MacFarlane; ADMINISTRATIVE SUPPORT Janet Mumford, Liz Ellis

##### ASIA

JAPAN NEWS BUREAU: Dennis Normile (contributing correspondent); CHINA REPRESENTATIVE Hao Xin; Pallava Bagla (contributing correspondent, India)

#### SCIENCE NOW: www.sciencenow.org

EDITOR Erik Stokstad

#### SCIENCE'S NEXT WAVE: www.nextwave.org

MANAGING EDITOR Wendy Yee; SENIOR EDITOR Nicole Ruediger; WRITER Melissa Merti; CANADA EDITOR Charles Boulakia; ASSISTANT Suzanne Moore

#### AAAS BOARD OF DIRECTORS

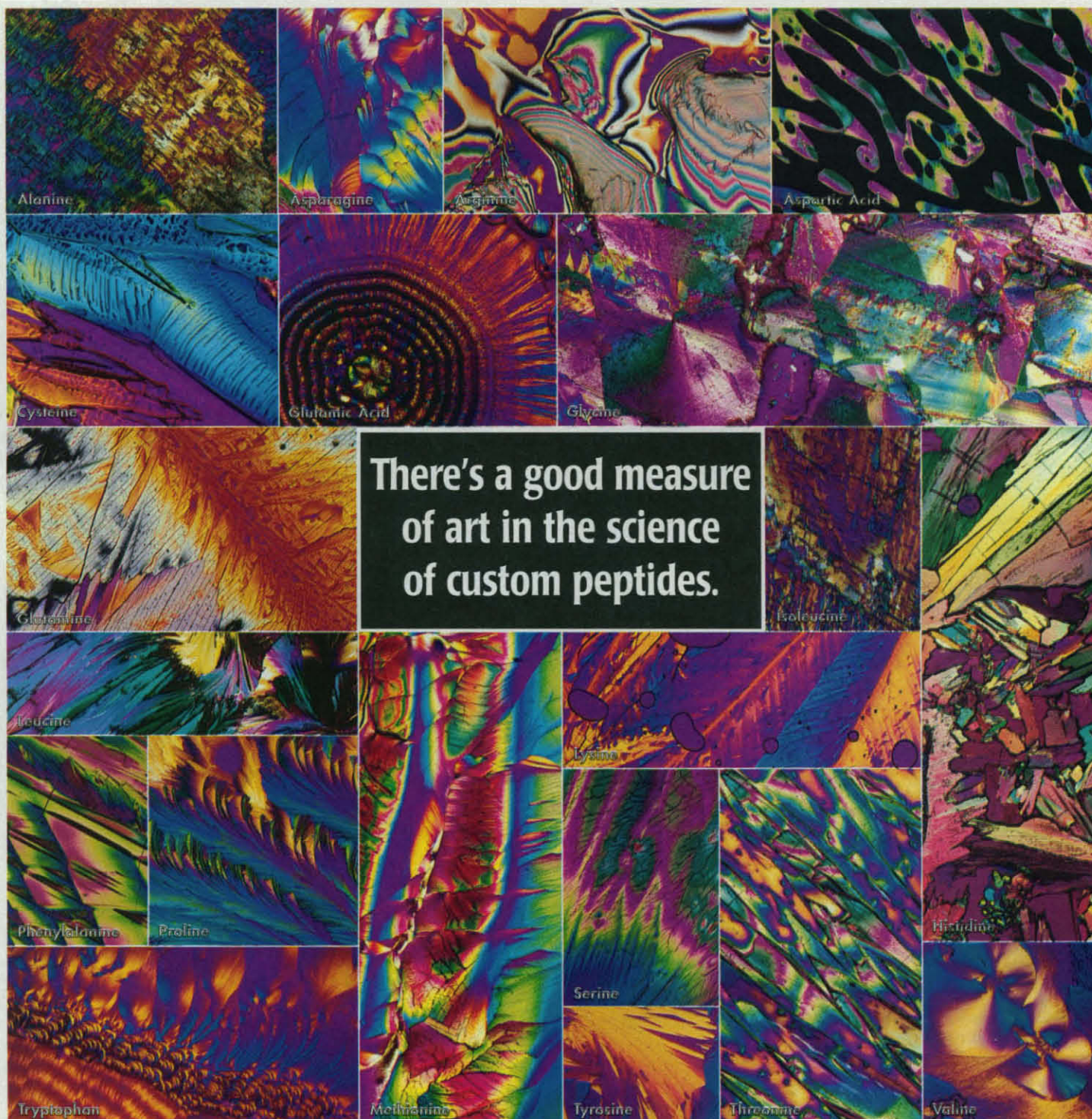
RETIRING PRESIDENT, CHAIR M. R. C. Greenwood  
PRESIDENT Stephen Jay Gould  
PRESIDENT-ELECT Mary Lowe Good  
TREASURER William T. Golden  
EXECUTIVE OFFICER Richard S. Nicholson

Lewis M. Branscomb; Robert D. Goldman; Alice S. Huang; Sheila Jasanoff; Sally Gregory Kohlstedt; Marcia C. Linn; Neena B. Schwartz; David E. Shaw

Published by the American Association for the Advancement of Science (AAAS). Science serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in Science—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, to advance education in science, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.





There's a good measure  
of art in the science  
of custom peptides.

Peptides aren't always so pretty. In fact, some sequences can be downright adventuresome. The art is knowing which ones.

Your project may depend on our peptide. So before we put your sequence together,

Let us quote on your peptide and we'll send you a free micrograph T-shirt.

**1-800-498-2098**

<http://www.genosys.com>

we'll take it apart – with a thorough analysis, just to make sure

there won't be any surprises later.

And if we see a potential problem, we'll tell you. That way, we can talk it over, and

offer suggestions to improve your odds of success. Then, because every Genosys custom peptide comes with a 100% satisfaction guarantee, we'll do our best to get it right.

Of course, you'll get proof of performance: mass spectral analysis for composition, and HPLC for purity. Antisera service and a wide variety of modifications are also available.

Want a closer look? Let us quote on your peptide, and we'll send you a free poster. To see something really beautiful, place an order.

*Micrographs courtesy of Michael W. Davidson, director of the Optical Microscopy Division of the National High Magnetic Field Laboratory.*

**FREE micrograph T-shirt  
with your quotation**



**GENOSYS**

Genosys Biotechnologies, Inc., The Woodlands, Texas, Phone: (281) 363-3693, E-Mail: [info@genosys.com](mailto:info@genosys.com)

Cambridge, U.K., Phone: (+44) (0)1223 839000, E-Mail: [genosys@genosys.co.uk](mailto:genosys@genosys.co.uk)

Hokkaido, Japan, Phone: 81 133 73 5005, E-Mail: [genosys@genosys.co.jp](mailto:genosys@genosys.co.jp)

Circle No. 65 on Readers' Service Card

©1998 Genosys Biotechnologies, Inc.



**BIO\*WHITTAKER**

A **CAMBREX** Company

the  
**WORLD Center**  
for Cell Culture  
*Excellence.*



# **The Best Source For: Normal Human Cells & Optimized Media Standardized & Guaranteed!**

**...Innovative Cell Systems for Research in:**

- Cell Biology • Cell Therapy • Disease Studies • Hematopoiesis
- Drug Screening • Toxicology • Immunology



## **NORMAL HUMAN CELL SYSTEMS™**

**Optimized Low-Serum Medium**  
**Blot Products from Human Cells**  
**Custom Cell Isolations**  
**Custom Media Formulations**

### **Cell Types Available:**

Adipocytes (white, brown & epicardial)  
Dendritic, (Peripheral Blood)  
Endothelial Cell Types:  
Artery (Aortic, Coronary, Hepatic,  
Iliac, Popliteal, Pulmonary, Renal,  
Umbilical)  
Colon  
Vein (Hepatic, Saphenous, Umbilical)  
Epithelial Cell Types:  
Bladder, Bronchial, Small Airway,  
Keratinocytes, Mammary,  
Prostate, Renal (Cortical, Proximal  
Tubule, Glomerular), Ureter

Fibroblasts, (Aortic, Dermal, Hepatic)  
Hepatocytes  
Melanocytes, (Adult, Neonatal)  
Mesangial  
Microvascular Cell Types:  
Bladder, Cardiac, Cervical, Dermal,  
Lung, Uterine  
Mononuclear, (Peripheral Blood)  
Muscle Cell types:  
Cardiac, Skeletal  
Muscle- Smooth, Cell Types:  
Aortic, Bronchial, Bladder, Colon,  
Coronary, Prostate, Pulmonary, Renal  
Artery & Vein, Saphenous Vein,  
Umbilical Artery, Uterine, Ureter  
Neural Progenitor Cells, Neural (Astrocytes)  
Osteoblasts  
Pericytes, (Retinal)  
Stromal Cell Types:  
Cardiac, Prostate



## **PRIMARY HUMAN HEMATOPOIETIC CELLS**

### **Bone Marrow and Cord Blood Derived:**

Mononuclear Cells  
CD34<sup>+</sup> Cells  
AC133<sup>+</sup> Cells

### **Cord Blood Derived:**

T-Cells & B-Cells  
Erythroid Progenitors  
Bone Marrow Stromal Cells  
Dendritic Cell Precursors  
Quadratox™, 4-Species Panel  
Bone Marrow Mononuclear Cells  
(Baboon, Canine, Murine & Human)

### **Assay Services :**

Colony Assays  
LTC-IC Assays  
CD34<sup>+</sup> Cell Proliferation Assays  
Lineage Marker ELISA



## **ANIMAL CELL SYSTEMS™**

**Standardized, Quality Controlled  
Non-Human Cell Systems from Several  
Species and Anatomic Locations**

### **Cell Types Available:**

Epithelial, Endothelial, Hepatocytes, Muscle,  
Neural (Astrocytes, Stem Cells), Stromal,  
and others...

### **Species Available:**

Bovine, Murine, Porcine, Rat, Simian, and  
others...

Custom Primary Isolations Available

**BioWhittaker is a certified ISO-9001 Quality Management System Company**

**UK:** 011 8 979 5234 • **Europe:** 32 87 32 16 11 • **USA, Canada:** (800) 852-5663 • **All other:** 301 898-7025

**E-Mail:** cs@biowhittaker.com • **Internet:** www.biowhittaker.com or, www.clonetics.com or, www.poietic.com

©1999 BioWhittaker, Inc., A Cambrex Company. The symbols ® and ™ refer to trademarks in the U.S.A. and other countries. All rights reserved.

Circle No. 12 on Readers' Service Card



# COLLOQUIUM ANNOUNCEMENT

## “AUTOMATION IN THREAT REDUCTION AND INFECTIOUS DISEASE RESEARCH: NEEDS AND NEW DIRECTIONS”

**APRIL 29-30, 1999**

THE NATIONAL ACADEMY OF SCIENCES AUDITORIUM, WASHINGTON, DC

*Organizers Kumar Patel, Tony J. Beugelsdijk, Scott P. Layne*

### DESCRIPTION

To make headway in many problems in medicine and biology requires enormous quantities of laboratory-based data. The limiting factor often is the fact that humans, unaided, are not capable of generating such vast inventories of data. Today, for the first time, various scientific disciplines and powerful technologies can be brought together to level the playing field against a number of the important problems facing society.

The scientific side of the Colloquium will focus on the needs for measuring, detecting, and monitoring in areas such as: 1) recognizing and addressing established and emerging infectious diseases; 2) ensuring a safe food supply; 3) averting catastrophic bioterrorism and biowarfare; and 4) advancing human genetics and molecular medicine. The technological side of the Colloquium will focus on the various automation, robotic, computer, information, Internet, and microscale laboratory technologies that are available for supporting such scientific needs. The objective is to identify specific scientific needs, assess current research practices and their limitations, and then consider strategic ways for integrating new high-throughput laboratory tools and technologies.

• **Infectious Diseases.** As we move into the 21st century, infectious diseases will pose formidable challenges from a variety of directions. The Colloquium will therefore consider scientific needs for such infectious diseases as influenza, tuberculosis, HIV/AIDS, and other drug-resistant infections; and routes toward developing high-throughput laboratory resources that can accelerate basic science, clinical trials, and public health/epidemiology investigations throughout the world.

• **Food Supply.** Pathogenic food-borne infections are increasing in the U.S. and elsewhere, demanding stringent public health monitoring. The Colloquium will consider scientific needs for protecting the food supply and environment, and ways to engineer high-throughput laboratory resources for improving public health efforts.

• **Biowarfare and Bioterrorism.** The malicious release of hazardous infectious agents poses significant threats to national and global security. The Colloquium will consider the needs for conventional laboratory automation and the development and integration of newer microscale technologies for carrying out a broad range of activities.

• **Further Applications.** The Colloquium encourages participation and interest from a widespread scientific constituency. Its multidisciplinary approach entails broad-based participation from academic, governmental, and industrial sectors.

In addition, the two-day program of presentations and panel discussions has an educational component that should be of interest to policy makers. In order to facilitate tangible outcomes from the Colloquium, a “cross-cutting” approach will be emphasized. This approach recognizes that new tools and technologies from one scientific discipline can be carried over to others, and that the synthesis will result in synergy.

### SPONSORS

**Association for Laboratory Automation  
Centers for Disease Control and Prevention  
Department of Energy  
Department of Health and Human Services, Office of  
Emergency Preparedness  
Institute of Medicine  
Los Alamos National Laboratory  
National Academy of Engineering  
University of California, Los Angeles**

### SPEAKERS

#### INTRODUCTION

**Kumar Patel**, University of California, Los Angeles, CA

#### INFECTIOUS DISEASES

**Roy M. Anderson**, University of Oxford, Oxford, UK

**Nancy J. Cox**, Centers for Disease Control and Prevention, Atlanta, GA

**James M. Hughes**, Centers for Disease Control and Prevention, Atlanta, GA

**Scott P. Layne**, University of California, Los Angeles, CA

**Gary J. Nabel**, University of Michigan, Ann Arbor, MI

**Peter L. Nara**, Biological Mimetics Inc., Frederick, MD

**Ariel Pablos-Mendez**, Columbia College of Physicians, New York, NY

**Gary K. Schoolnik**, Stanford University, Palo Alto, CA

**Jeffery K. Taubenberger**, Armed Forces Institute of Pathology, Washington, DC

#### FOOD SUPPLY

**John C. Ballar III**, University of Chicago, Chicago, IL

**Joseph Rodricks**, Life Sciences Consultancy, Washington, DC

**Bala Swaminathan**, Centers for Disease Control and Prevention, Atlanta, GA

#### BIOWARFARE AND BIOTERRORISM

**Ken Alibek**, Battelle Memorial Institute, Alexandria, VA

**Ashton B. Carter**, Harvard University, Cambridge, MA

**Donald Kerr**, Federal Bureau of Investigation, Washington, DC

**Gerald Parker**, U.S. Army Medical Research Inst. of Infectious Diseases, Frederick, MD

**William C. Patrick III**, BioThreats Assessment, Frederick, MD

#### FURTHER APPLICATIONS

**Russell J. Howard**, Maxygen Inc., Redwood City, CA

**Leena Peltonen**, University of California, Los Angeles, CA

**David J. Galas**, Keck Graduate Institute of Applied Life Sciences, Claremont, CA

**J. Craig Venter**, Celera Genomics, Rockville, MD

#### TECHNOLOGIES

**George A. Bekey**, University of Southern California, Los Angeles, CA

**Tony J. Beugelsdijk**, Los Alamos National Laboratory, Los Alamos, NM

**James H. Jett**, Los Alamos National Laboratory, Los Alamos, NM

**Gary W. Kramer**, National Institute of Standards and Technology, Gaithersburg, MD

**David J. Lipman**, National Library of Medicine, Bethesda, MD

**Thomas Marr**, Genomica Corporation, Boulder, CO

**Stephen S. Morse**, Defense Advanced Research Projects Agency, Arlington, VA

**J. Michael Ramsey**, Oak Ridge National Laboratory, Oak Ridge, TN

**REGISTRATION FEE \$200** (non-refundable/can be transferred) includes meals (dinner on April 29th) and one copy of Colloquium proceedings. Accommodations are self-arranged by attendees.

#### MAIL REGISTRATION

Name \_\_\_\_\_  
Affiliation \_\_\_\_\_  
Position \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
State \_\_\_\_\_ Zip \_\_\_\_\_  
Phone \_\_\_\_\_ Fax \_\_\_\_\_  
E-Mail \_\_\_\_\_

#### PAYMENT (make checks payable to “Colloquium”)

Circle One:    Check Enclosed    VISA    Amer. Express    MasterCard  
Card No. \_\_\_\_\_ Expires \_\_\_\_\_  
Signature \_\_\_\_\_ Date \_\_\_\_\_

#### MAIL THIS FORM WITH PAYMENT TO:

Association for Laboratory Automation

Attn: Amy Thompson

University of Virginia, P.O. Box 572 HSC, Charlottesville, VA 22908

FAX (credit card only): 804-924-5718    TEL (registration questions): 804-924-9430

#### WEBSITE REGISTRATION

Web: <http://labautomation.org/colloquium/home.html>

#### FOR ADDITIONAL INFORMATION

Web: <http://www.nae.edu/colloquium>

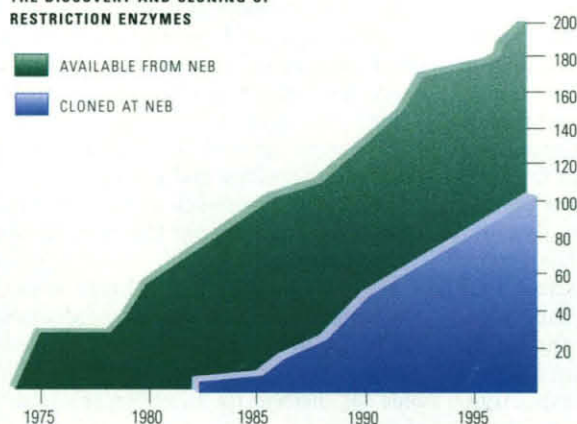


If your recipe called for butter...  
would you use margarine?

Shouldn't your choice of **Restriction Enzymes** reflect that level of excellence?

AN ON-GOING COMMITMENT TO  
THE DISCOVERY AND CLONING OF  
RESTRICTION ENZYMES

AVAILABLE FROM NEB  
CLONED AT NEB



At New England Biolabs, we appreciate that your research is important and demands the very best reagents. There is no room for compromise. As the only supplier that focuses on basic research and the discovery and production of essential enzymes for the manipulation of DNA, we truly understand the needs of scientists.

**Why compromise? Choose Restriction Enzymes from New England Biolabs.  
Better enzymes at a better price.**

Our aggressive restriction endonuclease screening and cloning programs enable us to maintain a position at the forefront of this field. NEB now supplies over 200 restriction enzymes, of which over 100 are recombinants. Currently, a total of 247 unique enzyme specificities have been identified worldwide.

#### Price Reductions

Recent cloning successes at NEB

<b>Dra III</b>	(6.7X more units/\$)	<b>SAVE 85%</b>
<b>SgrA I</b>	(5X more units/\$)	<b>SAVE 80%</b>
<b>SnaB I</b>	(5X more units/\$)	<b>SAVE 80%</b>

Improved production efficiency of recombinant *EcoR V*

<b>EcoR V</b>	(2X more units/\$)	<b>SAVE 50%</b>
---------------	--------------------	-----------------

For more information about restriction enzymes, visit us at [www.neb.com](http://www.neb.com)

- **New England Biolabs Inc.** 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (978) 927-5054 Fax (978) 921-1350 email: [info@neb.com](mailto:info@neb.com)
- **New England Biolabs Ltd., Canada** Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: [info@ca.neb.com](mailto:info@ca.neb.com)
- **New England Biolabs GmbH, Federal Republic of Germany** Tel. 0800/BIOLABS (06196) 3031 Fax 0800/BIOLABX (06196) 83639 email: [info@de.neb.com](mailto:info@de.neb.com)
- **New England Biolabs (UK) Ltd.** Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: [info@uk.neb.com](mailto:info@uk.neb.com)

DISTRIBUTORS: Australia (07) 5594-0299; Belgium (0800) 1 9815; Brazil (011) 3666-3565; Denmark (39) 56 20 00; Finland (9) 584-121; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 2649-9988; India (542) 311473; Israel (03) 9229015; Italy (02) 381951; Japan (03) 5820-9408; Korea (02) 556-0311; Netherlands (033) 495 00 94; New Zealand (09) 980-6700; Norway 22 09 15 00; Singapore 4457927; Spain (93) 401 01 01; Sweden (08) 30 60 10; Switzerland (061) 486 80 80; Taiwan (02) 28802913

Circle No. 58 on Readers' Service Card

NEW ENGLAND  
**BioLabs** Inc.





# PCR optimization in one single experiment



The determination of the right annealing temperature is crucial for establishing a new PCR experiment. The new all-round genius **Mastercycler® gradient** is an innovative, compact thermal cycler for even the most demanding PCR\* applications. Its gradient function enables a temperature gradient of up to 20 °C to be generated across the block, thus optimizing the annealing, denaturation, or extension temperature in one single experiment. Its 96-position all-in-one universal block can accommodate 96 x 0.2 ml tubes, 77 x 0.5 ml tubes, or one 96-well plate – without block exchange.

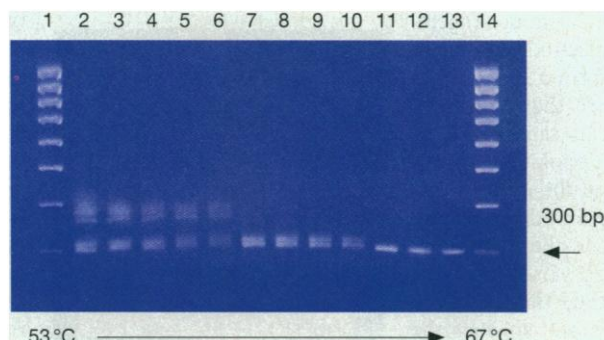
The exact block homogeneity ensures reproducible results. Variable, high incubation speeds as well as time and temperature increments for hot-start, touch-down, and long PCR provide maximum programming flexibility.

The **Mastercycler® personal** is designed to meet personal applications. Its 25-position all-in-one universal block holds 25 x 0.2 ml tubes, 16 x 0.5 ml tubes, or one microplate in a 5 x 5 grid.

Personal memory cards for 10 individually developed protocols allow an easy and comfortable method transfer between both Mastercycler models.

Circle No. 17 on Readers' Service Card

Of course, both Mastercyclers are licensed and authorized for PCR.



● Experimental determination of optimal annealing temperature. The calculated primer annealing temperature was 56.5 °C, the actual annealing temperature is 63.5 °C. The ribosomal spacer region of mycoplasmas from H9 cell cultures was amplified.

\*PCR (Polymerase Chain Reaction) is protected by patent. The patent is held by Hoffmann-La Roche. Practice of the patented Polymerase Chain Reaction (PCR) process requires a license. The Eppendorf Thermal Cyclers are Authorized Thermal Cyclers and may be used with PCR licenses available from the Perkin-Elmer Corporation. Their use with Authorized Reagents also provides a limited PCR license in accordance with the label rights accompanying such reagents.

**eppendorf**



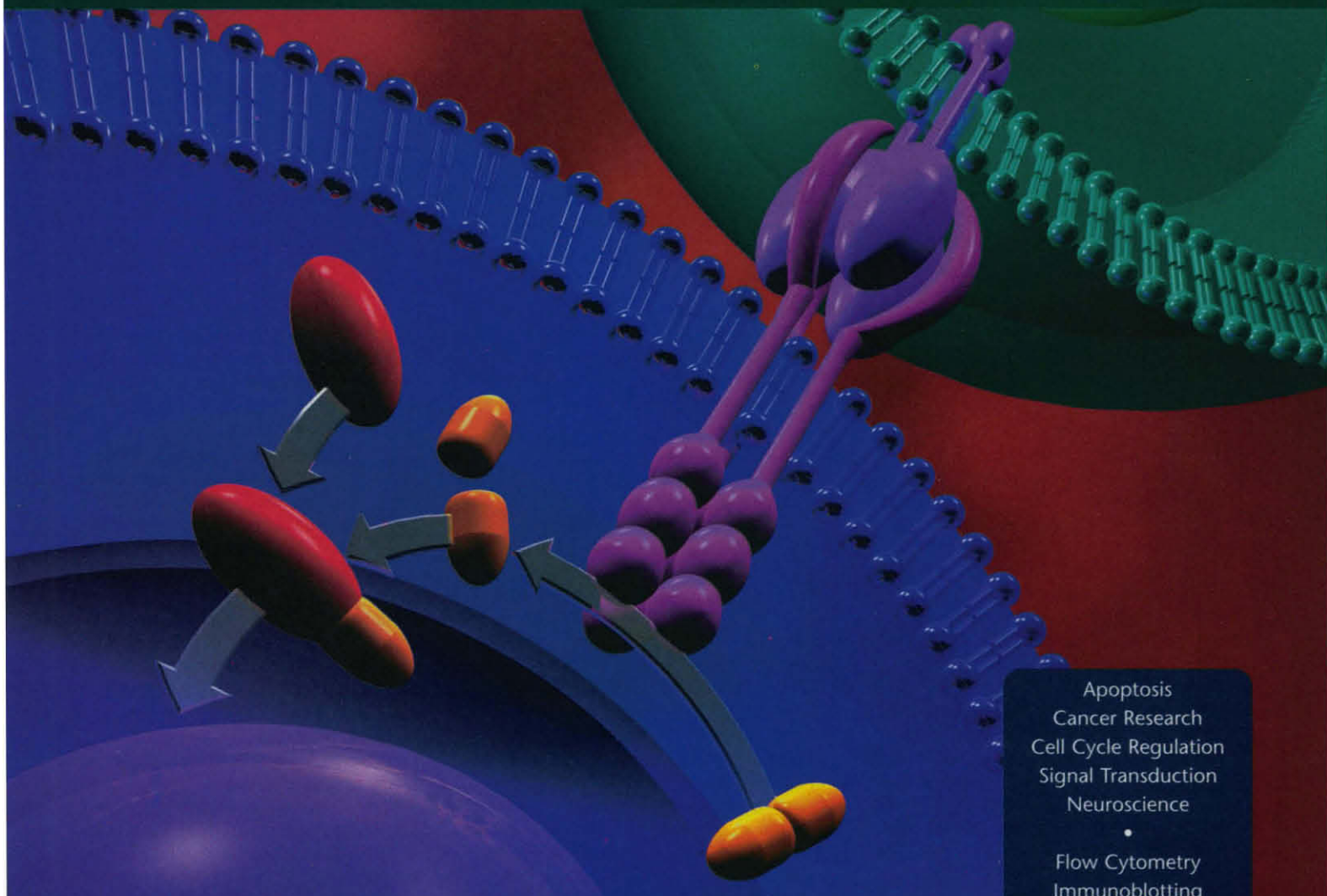
Eppendorf – Netheler – Hinz GmbH · 22331 Hamburg · Germany · Phone (+49) 40-53801-0 · Fax (+49) 40-53801-556  
website: [www.eppendorf.com](http://www.eppendorf.com) · e-mail: [eppendorf@eppendorf.com](mailto:eppendorf@eppendorf.com)

Eppendorf Scientific, Inc. · One Cantiague Road · Westbury, NY 11590-0207 · USA · Phone 800-421-9988 or 516-876-6800 · Fax 516-876-8599  
website: [www.eppendorfsi.com](http://www.eppendorfsi.com) · e-mail: [eppendorf@eppendorfsi.com](mailto:eppendorf@eppendorfsi.com)

eppendorf® is a registered trademark.



# Transduction Laboratories and PharMingen...



...team together to provide the most complete offering of cell biology reagents for the research community.

As Becton Dickinson companies, we remain committed to providing innovative and quality reagents and service for researchers worldwide.

To place an order for both Transduction Laboratories and PharMingen products, please call **1-800-848-6227** in the United States. Outside of the U.S., please contact your local Becton Dickinson/PharMingen representative for further information.

For research use only. Not for use in diagnostic or therapeutic procedures.

- Apoptosis
- Cancer Research
- Cell Cycle Regulation
- Signal Transduction
- Neuroscience
- 
- Flow Cytometry
- Immunoblotting
- Immunohistochemistry
- Immunoprecipitation
- 
- Antibodies
- Custom Services
- Peptides
- Kits
- Panels
- Screening Services



**Transduction Laboratories**

*A Becton Dickinson Company*

Tel 606-259-1550  
Fax 606-259-1413  
<http://www.translab.com>

PharMingen  
Tel 619-812-8800  
Fax 619-812-8888  
<http://www.pharmingen.com>



**PHARMINGEN**  
*A Becton Dickinson Company*

Circle No. 63 on Readers' Service Card





# FALCON® HTS FluoroBlok™ Inserts

**DIFFERENT FOR WHAT YOU CAN SEE.**

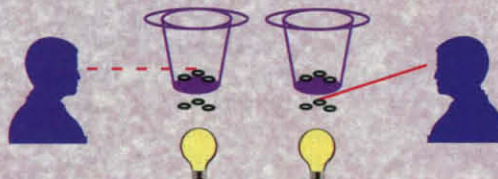
**DIFFERENT FOR WHAT YOU CAN'T SEE.**

Now you can detect cell migration and invasion in one homogeneous fluorescence assay system!

FALCON® HTS FluoroBlok™ Inserts save time and labor in chemotaxis, cell migration and invasion assays by automating your assay detection with fluorescence. Get rapid data collection without the need for plate washing or tedious, manual cell scraping and counting. And with FALCON HTS FluoroBlok Inserts you can chart migration of cells and molecules in real time without dismantling or destroying the insert. For more information contact your local Becton Dickinson Labware Representative today, or call 1-800-343-2035!



*Fluorescently labeled cells above the membrane are made invisible by the exclusive FluoroBlok™ light opaque membrane.*



*Once labeled cells migrate through the membrane, they are no longer shielded from the light source and are now easily detected with a fluorescence plate reader.*

**BECTON  
DICKINSON**

For More Information, Visit Our Web Site...[www.bd.com/labware](http://www.bd.com/labware) or call 1-800-343-2035

Circle No. 33 on Readers' Service Card





As they work to advance science,  
labs around the world use our  
filters and filter-based systems  
1,000,000 times a day.

pure science™



The  
company  
that  
brought  
you  
**Sequenase**<sup>™</sup>  
proudly  
brings you

Thermo Sequenase.<sup>™</sup>  
The new standard  
for manual cycle  
sequencing.

... **Thermo**  
**Sequenase**<sup>™</sup>  
for "doubt-free"  
<sup>33</sup>P-Terminator  
Sequencing.



Are your cycle sequencing results leaving you in doubt?  
Strong stops, background sequence causing problems?

### Thermo Sequenase Radiolabelled Terminator Cycle Sequencing Kit

The combination of USB's Thermo Sequenase Terminator Cycle Sequencing Kit with Amersham Pharmacia Biotech's radiolabelled terminators will give you sequencing results beyond a shadow of a doubt.

**Thermo Sequenase** - gives excellent performance at cycle sequencing temperatures. Helps eliminate secondary structure artifacts.

**<sup>33</sup>P-labelled terminators** - yield detection of only truly terminated sequencing fragments. False terminations are not visible because these fragments are not labeled.

- Eliminate stops and BAFLs. (Bands Across all Four Lanes)
- Read the first base after the primer.
- Crisp, clean sequence.
- Detect heterozygotes and mutants more easily.
- Sequencing directly from bacterial colonies is possible.

No other combination for manual cycle sequencing gives more information per gel — long reads, accurate sequence. Doubt-free results.

Above: Elimination of bands across all four lanes (BAFLs) in plasmid template.

Fig. a) Using the Thermo Sequenase Radiolabelled Terminator Cycle Sequencing Kit.

Fig. b) Compared to standard <sup>32</sup>S-dATP cycle sequencing where a strong BAFL is observed.

To order within the United States contact USB directly at 1-800-321-9322 or e-mail us at [customerserv@usbweb.com](mailto:customerserv@usbweb.com). For your authorized USB distributor outside the United States, please contact your local Amersham Pharmacia Biotech office.

USB Corporation, 26111 Miles Road  
Cleveland, OH 4412  
800-321-9322  
[www.usbweb.com](http://www.usbweb.com)



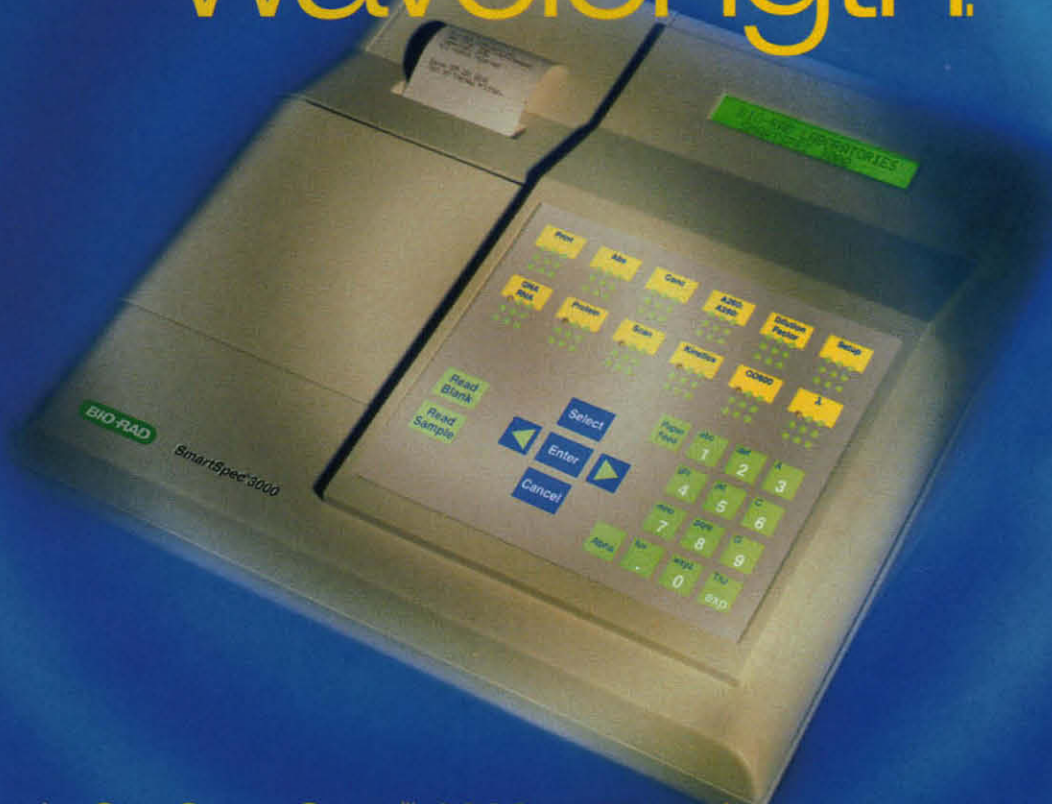
Rediscover the chemistry

© 1999 usb corporation. Sequenase and Thermo Sequenase are trademarks of Amersham Pharmacia Biotech Limited or its subsidiaries.

Circle No. 38 on Readers' Service Card



If you want  
**greater flexibility,**  
 we're on the same  
**wavelength.**



Our SmartSpec™ 3000 spectrophotometer expands your options with a **wide wavelength range.**

- MOLECULAR CALCULATOR
- TOUCH-BUTTON OPERATION
- DNA/RNA,  $A_{260}/A_{280}$
- PROTEIN ASSAYS
- WAVELENGTH SCANNING
- SIMPLE KINETICS
- O.D. 600

And that's just for starters. The new SmartSpec 3000 spectrophotometer lets you do a lot more for a lot less. It extends absorbance measurements from 200 to 800 nm, making it ideal for virtually any molecular biology or proteomic technique. It doubles as a molecular calculator for quick conversions to standard units. Better still, its intuitive, user-friendly interface lets you access any function with the touch of a button. See for yourself why SmartSpec 3000 is making waves. Contact your local representative for more information, or visit us on the web at [discover.bio-rad.com](http://discover.bio-rad.com) and get a free lab timer!

**BIO-RAD**

Bio-Rad  
Laboratories

Life Science  
Group

Website [www.bio-rad.com](http://www.bio-rad.com) U.S. (800) 4BIORAD Australia 02 9914 2800 Austria (01)-877 89 01 Belgium 09-385 55 11 Canada (905) 712-2771  
 China 86-10-62051850/51 Denmark 45 39 17 99 47 Finland 358 (0)9 804 2200 France 01 43 90 46 90 Germany 089 318 84-0  
 Hong Kong 852-2789-3300 India (91-11) 461-0103 Israel 03 951 4127 Italy 39-02-216091 Japan 03-5811-6270 Korea 82-2-3473-4460  
 Latin America 305-894-5950 Mexico 514-2210 The Netherlands 0318-540666 New Zealand 64-9-4152280 Russia 7-095-4585822  
 Singapore 65-2729877 Spain 34-91-661-7085 Sweden 46 (0)8 627 50 00 Switzerland 01-809 55 55 United Kingdom 0800-181134 Sig 100798

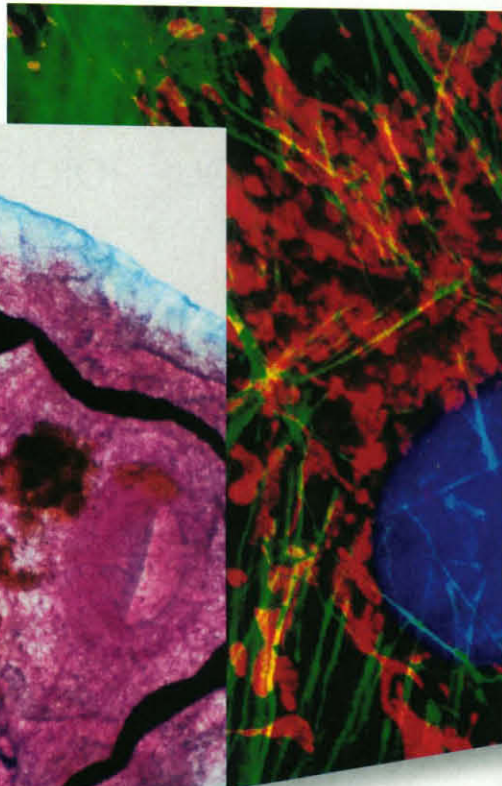
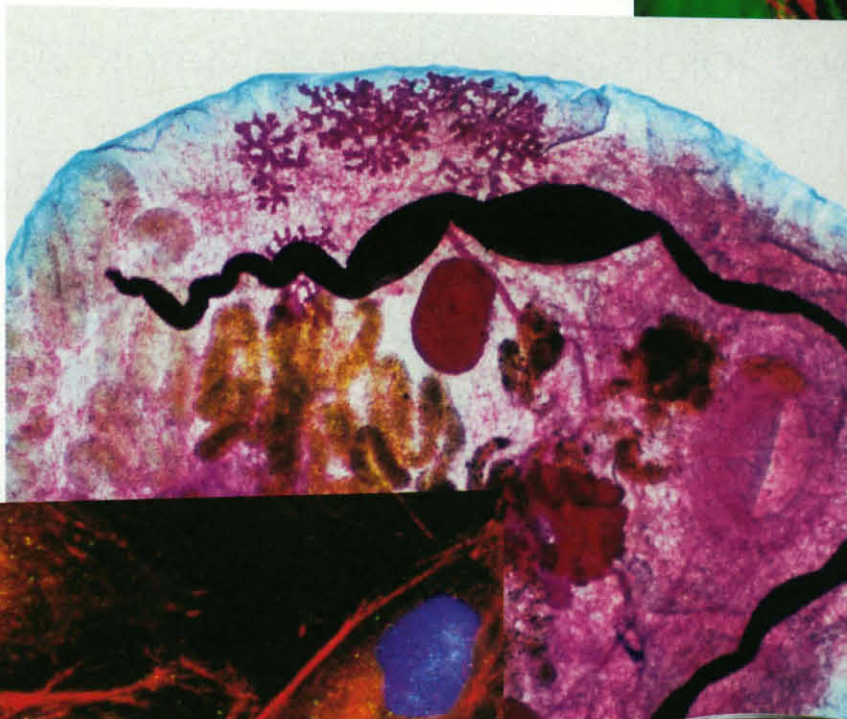
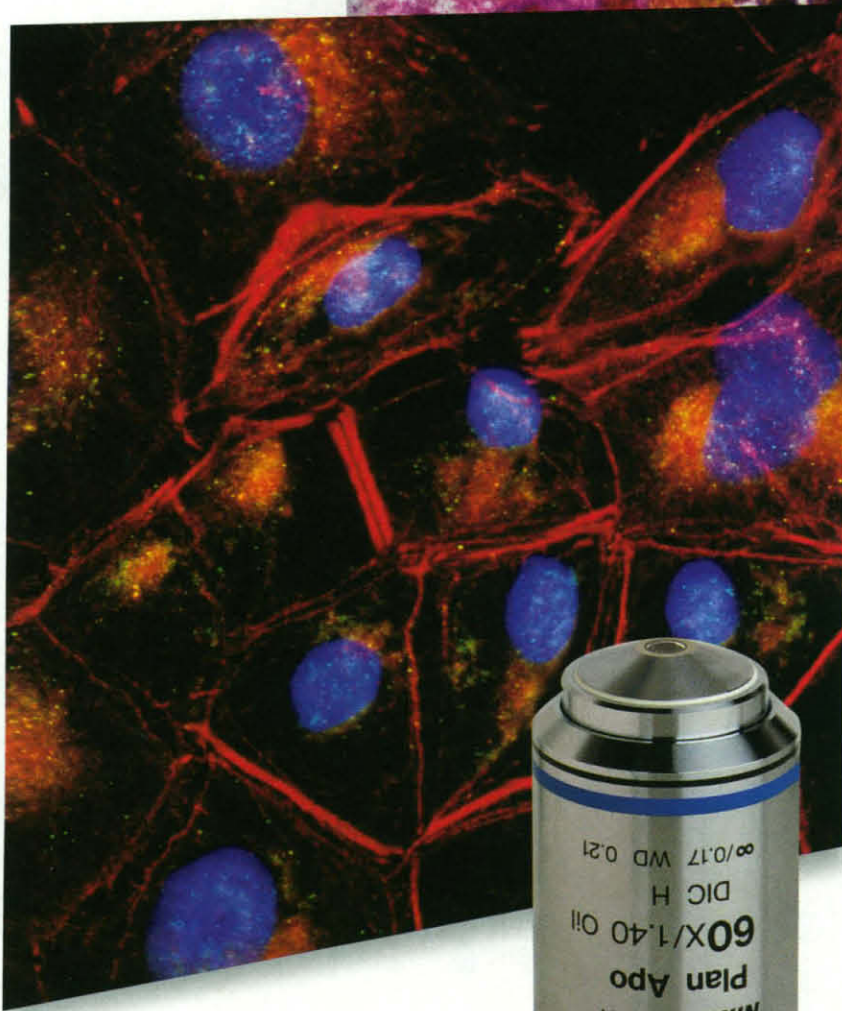
Circle No. 41 on Readers' Service Card



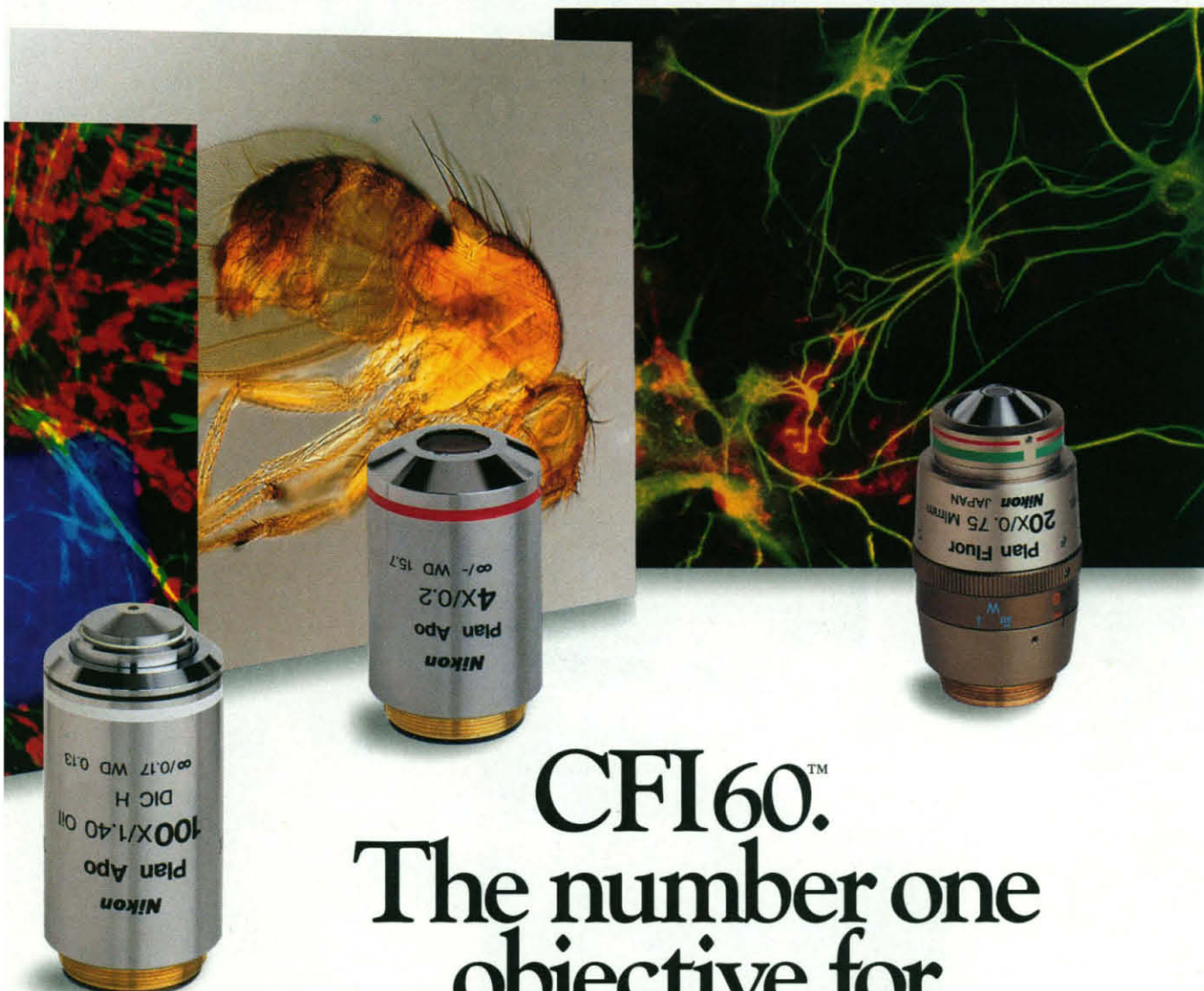
MILLIPORE

It's our total dedication to improving productivity, whether you're developing assays or decontaminating fluids. It's our focus on fitting a system to your application, from designing screening plates compatible with your robots to customizing lab water systems to your particular process. And finally, it's our expertise in microbiology, biochemistry and analytical science, as well as the knowledge reflected in the design of our products, the clarity of our manuals, the substance of protocols, and the breadth of our live and on-line support. Put our pure science to work for you. **Call 1-800-MILLIPORE.**  
**Or visit [www.millipore.com](http://www.millipore.com)**









# CFI60.<sup>TM</sup>

## The number one objective for every objective.



The Nikon Eclipse E800<sup>TM</sup> is America's number one selling research microscope in its class.\* What's the secret of our success?

### Our CFI60 Technology.

The CFI60 chromatic aberration-free objectives have overcome the limitations of conventional infinity systems — with the longest working distances, highest numerical apertures, and the widest magnification range and documentation field sizes ever. Nikon's advanced technology in glass formulation, lens manufacture and coating processes have redefined infinity optics. With this technology, we have achieved higher performance levels by incorporating a 60mm objective parfocal distance, a 25mm objective thread size and a standard 25mm field of view.

### Enjoy the widest range in objectives for the most diverse observation requirements.

With over 80 Nikon CFI60 objectives, including our exclusive 0.5X and the high UV transmission universal Plan Fluor series, you'll find we have the lens for you. Also available are several objectives for techniques such as confocal, microinjection and detection of GFP expression that can be utilized for phase contrast, DIC, fluorescence and brightfield. Call 1-800-52-NIKON, ext 331 today for a demonstration of our CFI60 objectives, and you'll soon find the best objective to meet your objective.

[www.nikonusa.com](http://www.nikonusa.com)



# Nikon.

## Redefining Infinity

Circle No. 66 on Readers' Service Card

\*Based on the Opto-Precision Instruments Association's (OPIA) Fourth Qtr. 1997, U.S.A. Microscope Survey

© 1998 Nikon Inc.



# DOUBLE FEATURE



Access your frequently used specimens without disturbing long-term samples.

- Forma's unique Double Door Option (U.S. Patent #5,600,966) is available on 900 Series, 8500 Series and Power Plus ULT freezers.
- Allows frequently used specimens to be stored in the top chamber while long-term storage items remain undisturbed in the bottom.
- Each door uses a single draw door latch with key lock to ensure door closure and product security.
- Non-CFC, Non-HCFC, Non-flammable and commercially available refrigerants.
- Double Door ULT Freezers are UL Listed, CSA Certified and bear the CE Mark.



**Forma Scientific, Inc.**

Box 649 · Marietta, OH 45750  
740-373-4763 · Fax: 740-373-6770  
USA and Canada 800-848-3080  
International Distributors Worldwide  
An ISO 9001 Company  
<http://www.forma.com>

*Forma Scientific is a subsidiary of  
ThermoQuest Corporation, a public subsidiary  
of Thermo Instrument Systems Inc.,  
a Thermo Electron Company*

Circle No. 35 on Readers' Service Card



# the search for meaning

**"Nothing in life is to be feared.  
It is only to be understood".**

Marie Curie (1867-1934).  
Polish-French Chemist. Two time Nobel Prize winner.

Today's science is faster,  
more automated and  
more routine than in the  
days of the first pioneers  
and we have all had to  
learn new skills.

Like juggling - the ability  
to balance budgets with  
demands for better  
quality data. And

firewalking - the capacity  
to deliver greater  
throughput and more  
reliable results at the  
same time.

But there is still magic to  
be found and new  
mysteries to unravel. As  
Einstein said, "The  
important thing is not to  
stop questioning".

The Quantum  
Prep HT/96 Plasmid  
Miniprep kit with  
patented Quantum  
Prep Matrix.

Your fastest alternative  
for high throughput  
plasmid DNA purification.

Bio-Rad Laboratories has  
supported this quest for truth  
for more than 40 years. Our  
products provide the basis for  
new insights, new approaches,  
new discoveries.

For a new and better way.

Consider, for example, our  
specialized DNA purification  
products for sequencing,

transfection, agarose gel  
extraction, PCR and other  
applications. Products which  
give you highly purified DNA  
with higher yields, more  
quickly, and more accurately -  
like fluorescent sequencing  
accuracy of at least 98% over  
600 bases using Quantum  
Prep® plasmid prep kits - and  
very, very reliably.

So you save time and  
achieve more, allowing  
you to turn your  
attention to the real  
business of science.

More throughput, more  
quickly, more reliably,  
and at lower cost.

And we will go on  
supporting you with  
quality products and  
the quality of service  
you would expect from  
a market leader -  
wherever your mind  
and all our tomorrows  
take us.

## make a difference

**BIO-RAD**

[www.discover.bio-rad.com](http://www.discover.bio-rad.com)

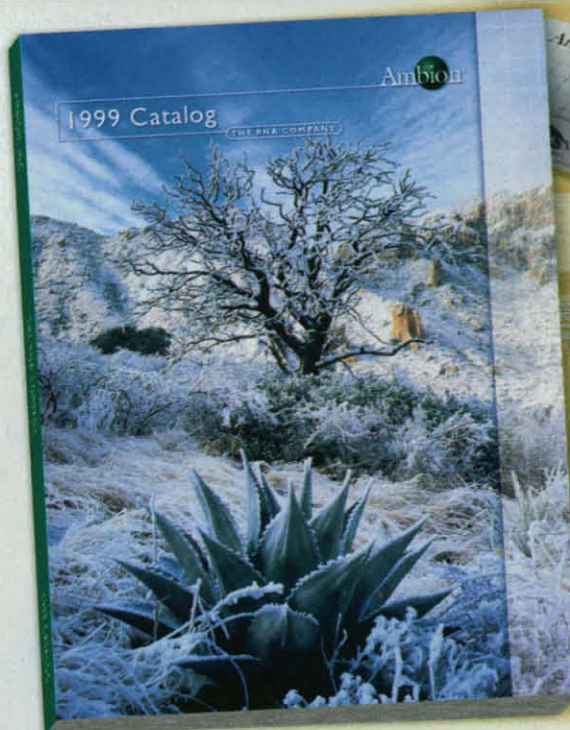
Circle No. 42 on Readers' Service Card



MORE THAN 97 NEW WAYS TO STUDY

# RNA Better, Faster, Easier.

Choose from the best selection of leading edge products and kits optimized for solving the unique challenges of RNA analysis. In the new 1999 Catalog, you will discover more than 97 new products to help you optimize isolation for higher yields, increase the sensitivity of detection assays and quantitate RNA better, faster and easier.



**ISOLATE, DETECT, QUANTITATE**

**Do you isolate, detect or quantitate RNA?  
Then you need the innovative products from  
Ambion, The RNA Company.**

## New in the 1999 Catalog

- NEW ADVANCES IN RNA ISOLATION THAT OPTIMIZE YIELDS
- TOOLS TO IMPROVE RT-PCR QUANTITATION AND USE RELATIVE RT-PCR IN A NEW WAY
- A REVOLUTIONARY METHOD TO PERFORM IN SITU HYBRIDIZATIONS
- NEW WAYS TO IMPROVE YIELDS IN TRANSCRIPTION:TRANSLATION REACTIONS

For a complete list of distributors visit our website, <http://www.ambion.com>

U.S. (800)888-8804  
Canada (800)445-1161



**GET INFORMATION  
NOW**  
VIA EMAIL ON THE  
BEST NEW PRODUCTS  
OF 1999:

To immediately receive descriptions, catalog numbers and prices on the hottest new products and to request your 1999 Catalog, email your postal mailing address to [99cataloginfo@ambion.com](mailto:99cataloginfo@ambion.com)

Catalogs may also be requested by phone, fax or the reader service number below.

**Ambion®**  
THE RNA COMPANY



# Within budget. Without compromise.

Now available with

## MAX MODE

Faster ramping and  
higher sample volume.

*Exceptional value*

*Small footprint  
(1.3 square feet of  
bench space)*

*Interchangeable  
sample blocks*

*Fast, uniform  
heating and cooling*

*Easy, intuitive  
programming*

## The New GeneAmp® PCR System 9700

Until now, deciding on the best thermal cycler for your lab often meant choosing between superior performance and affordability.

Not any more.

Because now, there's an entirely new thermal cycler that gives you more of what you're looking for.

That thermal cycler is the GeneAmp® PCR System 9700.

The GeneAmp PCR System 9700 combines the proven quality and reliability of the GeneAmp PCR System 9600 with unprecedented performance, the versatility of interchangeable sample blocks and a graphical user interface that streamlines operation.

But perhaps the most attractive feature of the GeneAmp PCR System 9700 is that it packs all of this into one compact instrument that fits easily on your lab bench—and into your budget.

Find out how the GeneAmp PCR System 9700 makes choosing the right thermal cycler easier than ever. In the U.S., call PE Applied Biosystems at 1-800-345-5224. Outside the U.S., contact your local sales representative. Or visit us on the Internet at [www.thermalcycler.com](http://www.thermalcycler.com).

## PE Applied Biosystems

Europe: Langen, Germany Tel: 49 (0)6103 708 301 Fax: 49 (0)6103 708 310  
Japan: Tokyo, Japan Tel: (047) 380-8500 Fax: (047) 380-8505  
Latin America: Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223  
Australia: Melbourne, Australia Tel: 1 800 033 747 Fax: 61 3 9212-8502

Perkin-Elmer PCR reagents are developed and manufactured by Roche Molecular Systems, Inc., Branchburg, New Jersey, U.S.A.



The PCR process is covered by patents owned by Hoffmann-La Roche, Inc. and F. Hoffmann-La Roche Ltd. Perkin-Elmer is a registered trademark and PE Applied Biosystems, PE, and Applied Biosystems are trademarks of The Perkin-Elmer Corporation. GeneAmp is a registered trademark of Roche Molecular Systems, Inc. PE Applied Biosystems products are developed and produced under the quality requirements of ISO 9000.

Call  
**1-800-345-5224**  
to order

Circle No. 67 on Readers' Service Card



# ASCI/AAP Joint Annual Meeting

Chicago, Friday, April 23 – Sunday April 25, 1999

## KEYNOTE LECTURE

"New Era of Academic Medicine"

*William Kelley, University of Pennsylvania*

## ASCI PLENARY SESSION

Presidential Address

*Ajit Varki, University of California, San Diego*

## ASCI New Member Presentations

"Helping orphan receptors find their growth factor partners:  
applications in neurodegeneration, obesity, bone growth and angiogenesis"

*George D. Yancopoulos Regeneron Pharmaceuticals*

"Diverse biological functions of the LDL receptor gene family"

*Joachim Herz, University of Texas*

"Manipulation of T helper commitment by retroviral gene transduction"

*Kenneth Murphy, Washington University*

"Telomerase, tumor suppressors and tumorigenesis"

*Ronald DePinho, Dana Farber Cancer Institute*

## ASCI Award and Lecture

*Richard Klausner, National Cancer Institute*

*Michael Welsh, University of Iowa*

*David Clapham, Children's Hospital of Boston*

## AAP/ASCI State of the Art Symposium in Medicine and Biology

"New Directions in angiogenesis research"

*Judah Folkman, Harvard University*

"Current challenges in AIDS research"

*Robert Gallo, Institute of Human Virology*

"Diseases of abnormal protein glycosylation: An emerging area"

*Stuart Kornfeld, Washington University*

"A proteolytic pathway that controls cholesterol metabolism"

*Michael Brown, University of Texas*

"G protein-coupled receptors and their regulation"

*Robert Lefkowitz, Duke University*

"Exploring the pathogenesis and treatment of cystic fibrosis lung disease"

*Michael Welsh, University of Iowa*

## AAP PLENARY SESSION

Presidential Address

*Robert Glickman, New York University School of Medicine*

## George M. Kober Medal Presentation

Presenter: Joseph Goldstein, Recipient: Jean Wilson, University of Texas

## AAP New Member Presentations

"Advances in Cognitive Neuroscience"

*Antonio Damasio, University of Iowa*

"Defective cytokine signaling in severe combined immunodeficiency diseases"

*Warren Leonard, National Institutes of Health*

"Nitric oxide in the respiratory cycle"

*Jonathan Stamler, Duke University*

"Thromboprotein: From Theory to Reality"

*Kenneth Kaushansky, University of Washington*

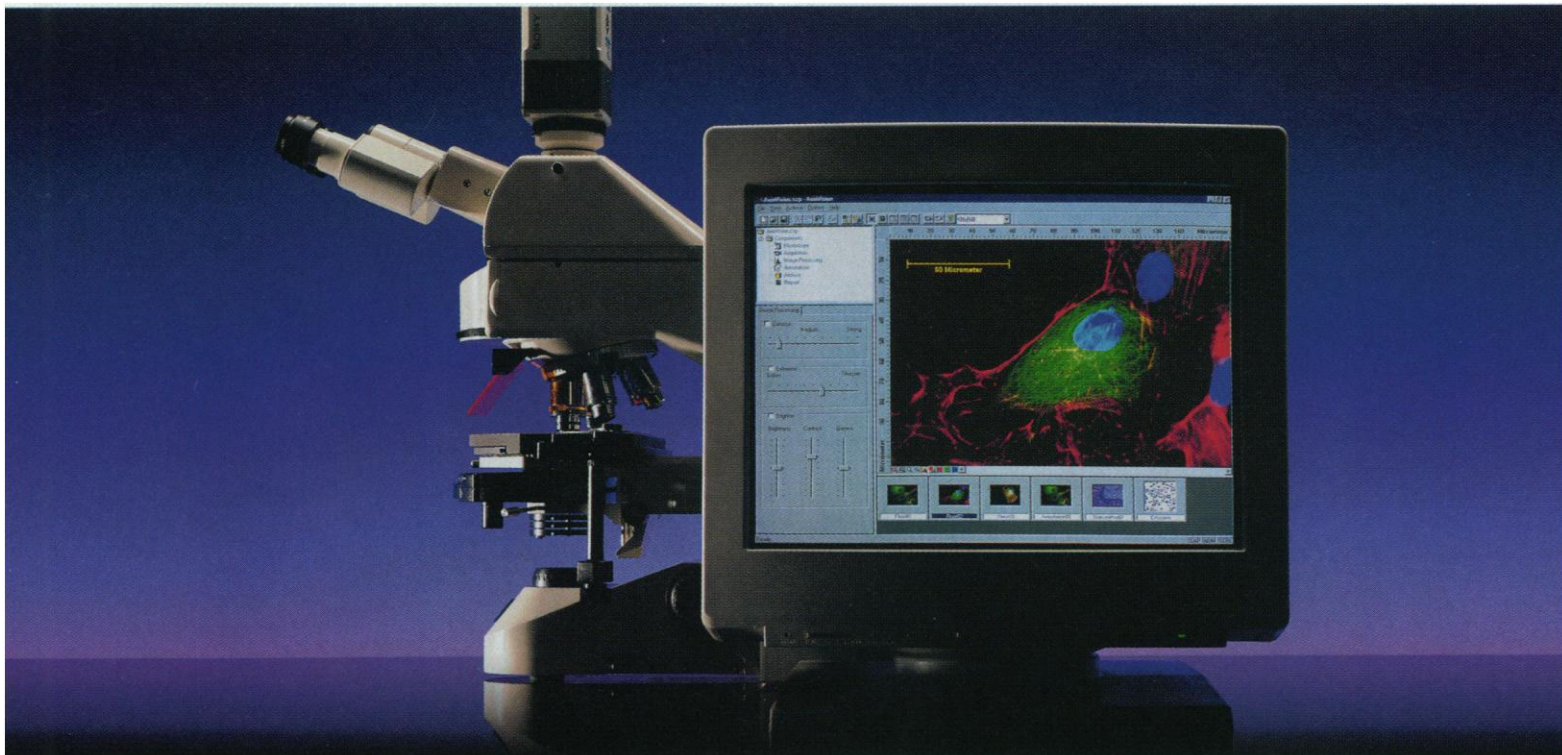
For information see: [http:// www.asci-jci.org/asci](http://www.asci-jci.org/asci) or contact the Joint Meeting Office 609-848-1000 x443

Circle No. 71 on Readers' Service Card



## Introducing Carl Zeiss Vision

# The New Force In Imaging For Microscopy.



Come to Zeiss for a total solution to your imaging needs. The best microscopes with the best optics, the highest resolution cameras, and now the best imaging software.

The new **AxioVision** modular image acquisition and archiving system represents a new level of flexibility for digital microscopy. Two modes are available: the application mode for routine, and the expert mode for research. **AxioVision** is suitable for all biological and

materials applications. The system provides fully integrated control of the microscope and camera; efficient image enhancement; archiving of image, text, measuring data and all microscope parameters; and automatic report generation.

We also have specific programs for 3D deconvolution, confocal microscopy, materials analysis, and the **KS Elispot** for the automatic evaluation of T-lymphocyte immunoassays.

The Carl Zeiss Vision series covers the full range of counting, sizing, statistical evaluation, and image enhancement tools for all research and industrial applications.

For a free evaluation of your imaging needs, contact your Zeiss representative.

**Call 800.233.2343 today.**

**Carl Zeiss Vision**  
total  
**solutions**  
for  
imaging

**Carl Zeiss, Inc.**  
Microscopy and Imaging Systems  
One Zeiss Drive  
Thornwood, NY 10594

800-233-2343  
Fax 914-681-7446  
micro@zeiss.com  
www.zeiss.com  
Circle No. 61 on Readers' Service Card





# DIRECT From Cells 2 Results

IN LESS THAN 3 HOURS

## cAMP and cGMP

Measure **directly**  
in 0.1M HCl!

- **NON** Radioactive!
- **NO** Neutralization!
- **NO** Extractions!
- **NO** Drying Down and Reconstitution!

## MORE KITS FROM

Assay Designs, Inc.

Prostaglandins, Leptins,  
Leukotrienes, Endothelins,  
Steroids, Nitric Oxide,  
Small Peptides and  
Rapid, Non-Radioactive  
Cyclooxygenase Activity

For more info

Assay Designs, Inc.  
Ann Arbor, MI USA

phone: (734) 668-6113 or (800) 833-8651

fax: (734) 668-2793

e-mail: [info@assaydesigns.com](mailto:info@assaydesigns.com)

website: [www.assaydesigns.com](http://www.assaydesigns.com)

Worldwide distribution!

Call for your local distributor.

Join us at Experimental Biology-Booth #1239

Circle No. 60 on Readers' Service Card

## First in Signal Transduction

### Products for:

- Apoptosis
- Lipid signaling
- Protein kinases/phosphatases
- Gene regulation
- Proteasome and proteases

Call: 800-942-0430

Visit: [www.biomol.com](http://www.biomol.com)

# BIOMOL®

Capture the Power

BIOMOL Research Laboratories, Inc.

5100 Campus Drive Plymouth Meeting, PA 19462-1123 USA

phone: 610-941-0430

fax: 610-941-9252

e-mail: [info@biomol.com](mailto:info@biomol.com)

Circle No. 14 on Readers' Service Card



## NEW TR717™ Luminometer

# A MEASURE OF Brilliance

Introducing the new TR717 Microplate Luminometer from Tropix. Now you can enhance your efforts with ultrasensitive detection of bioanalytes from the leader in luminescence. Only Tropix brings you a full line of matched luminescent reagents, assays and instrumentation designed for optimal performance in your lab.

### SENSITIVE.

Achieve low zeptomole\* detection levels with advanced digital photon counting.

### FLEXIBLE.

Command a unique constellation of features for superior versatility in applications and protocol design.

- Read 96- or 384-well plates
- Detect wide range of analyte concentration (>7 decades)
- High functionality with or without external PC
- Programmable reagent dispensers available
- Robotics-compatible
- Temperature control option

To request a free TR717 Luminometer brochure or to learn more about Tropix reagents and systems, call 1-800-542-2369.



 **TROPIX**

#### TROPIX

47 Wiggins Avenue  
Bedford, Massachusetts 01730  
USA  
Tel: 781-271-0045  
800-542-2369  
Fax: 781-275-8581  
E-mail: [info@tropix.com](mailto:info@tropix.com)

#### PE APPLIED BIOSYSTEMS

**USA**  
Foster City, CA  
Tel: 800-345-5224  
650-570-6667  
Fax: 650-638-5884

**Europe**  
Langen, Germany  
Tel: 49 6103 708 301  
Fax: 49 6103 708 310

**Canada**  
Mississauga, Ontario  
Tel: 800-668-6913  
905-821-8183  
Fax: 905-821-8246

**Japan**  
Chiba  
Tel: (0473) 80-8500  
Fax: (0473) 80-8505

**Latin America**  
Mexico City, Mexico  
Tel: 52-5-651-7077  
Fax: 52-5-593-6223

**Australia**  
Victoria  
Tel: (03) 9212-8585  
Fax: (03) 9212-8502

**PE Applied Biosystems**

\*(10<sup>-21</sup>)

Circle No. 68 on Readers' Service Card

Tropix is a registered trademark and TR717 is a trademark of Tropix, Inc.  
PE Applied Biosystems is a trademark of the Perkin-Elmer Corporation.

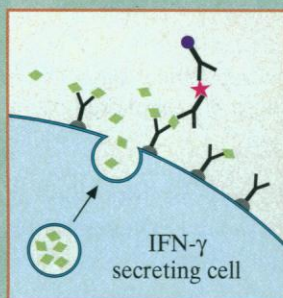
©1997 Tropix, Inc. All rights reserved. Printed in USA.



# MACS IFN- $\gamma$ Secretion Assay

## Isolation and analysis of antigen-specific T cells

- viable IFN- $\gamma$  secreting human cells
- highest sensitivity from  $10^{-6}$  to  $10^{-2}$
- peptide- and HLA-type-independent



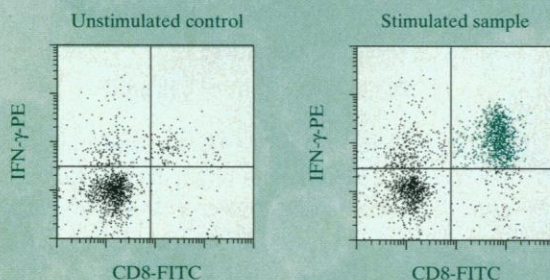
It's very simple:

MACS IFN- $\gamma$  Catch Reagent is attached to the cell surface and binds secreted IFN- $\gamma$ .

Bound IFN- $\gamma$  is stained with IFN- $\gamma$  Detection Antibody and MACS MicroBeads for analysis and enrichment.

### Example for analysis of Influenza-specific T cells after IFN- $\gamma$ Secretion Assay.

Brosterhus et al., 10th Int. Congress of Immunol., New Delhi 1998, pp. 1469-1473.



...enabling new concepts in basic  
and clinical research.

### For more information, call:

**Germany:**  
Friedrich-Ebert-Straße 68  
51429 Bergisch Gladbach  
Phone: +49-2204-8306-0  
FAX: +49-2204-85197

**USA:** Phone: 800 FOR MACS  
FAX: 530 888 - 8925  
**UK:** Phone: 01483 799800  
FAX: 01483 799811  
**France:** Phone: 01 56 98 16 16  
FAX: 01 56 98 16 17

[www.miltenyibiotec.com](http://www.miltenyibiotec.com)

**Miltenyi Biotec**

**MACS**



**Picture  
This  
In Your Lab!**

**\$14,987\***

### The Cyclone™ Storage Phosphor System

is a unique, compact unit which provides the highest quality images at a price that every lab can afford. Why share a system with another department when you can get images like this in your own lab?

- High resolution images acquired in less than one tenth the exposure time of film.
- Five logs of linear range makes the images quantitative in just one exposure.
- Eliminates film and developing chemicals.
- No more waiting for a shared instrument.
- Ideal for quantitative Southern, northern, and western blotting, PCR and sequencing gels, tissue sections and much more.
- Creates TIF images for publication right from OptiQuant for Windows 95®.

Call Packard today to learn how Cyclone can be a part of your lab and speed up your research progress!

\*Prices will vary outside the U.S.A. due to exchange rates, freight, duties, and local service.



### Packard Instrument Company

800 Research Parkway Meriden, CT 06450 U.S.A.  
Tel: 203-238-2351 Toll Free: 1-800-323-1891  
FAX: 203-639-2172 Web Site: <http://www.packardinst.com>  
Email: [webmaster@packardinst.com](mailto:webmaster@packardinst.com)

### Packard International Offices:

Australia 03-9543-4266 or 1 800 335 638; Austria 43-1-2702504;  
Belgium 31(0)2/481.85.30; Canada 1-800-387-9559;  
Central Europe 43 456 2230 015; Denmark 45-43909023 or 45-43907151;  
France (33) 1 46.86.27.75; Germany (49) 6103 385-151;  
Italy 39-2-33910796; Netherlands 31-50-549 1296; Russia 7-095-259-9632;  
Switzerland (01) 481 69 44; United Kingdom 44 (0)118 9844981



# LEXICON GENETICS BRINGS BIOTECHNOLOGY TO THE INTERNET



## lexgen.com

Circle No. 54 on Readers' Service Card

Internet Subscriptions **NOW** Available!  
Register **TODAY** for Access to OmniBank®'s Tens of Thousands  
of Gene Trap Mouse Clones and Gene Sequence Information.

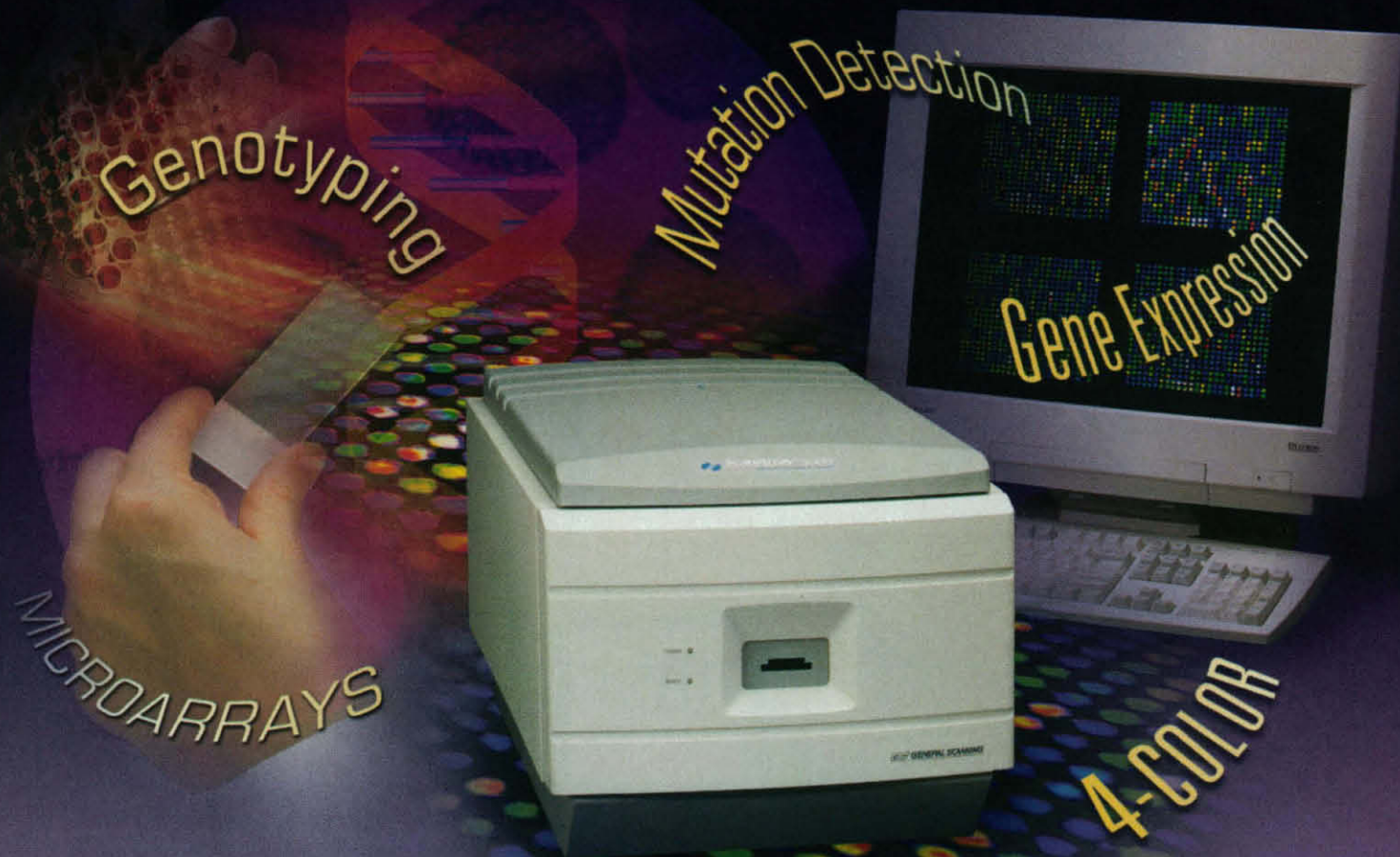
Non-Profit/Academic Subscriptions  
[www.lexgen.com/omnibank](http://www.lexgen.com/omnibank)



Commercial Inquiries  
[omnicorp@lexgen.com](mailto:omnicorp@lexgen.com)



# Leading the Way in Microarray Analysis



**GENERAL SCANNING** set the standard for microarray analysis using confocal laser scanning. The revolution continues with the new ScanArray® 4000 and 5000 systems, which offer four-color fluorescent imaging, higher sensitivity, resolution and throughput. Based on the experience of biochip pioneers and over 30 years of laser systems design, ScanArray systems now address a greater variety of microarray applications including gene expression, genotyping, mapping, high-throughput screening and drug discovery.

Now four-color fluorescent imaging is available with automated calibration, tracking and analysis of custom or commercially available microarrays. With numerous fluorescent dye options, ten emission wavelengths

ranging from 488nm to 700nm, 5µm resolution and Windows® NT software, ScanArray systems continue to lead the way in microarray analysis.

Call us to configure a ScanArray system that meets your needs. A "build-to-order" process allows us to quickly customize and deliver your ScanArray system. For more information or an evaluation using your microarray samples, contact General Scanning at **617-924-1010** or **[www.scanarray.com](http://www.scanarray.com)**.

**GS GENERAL SCANNING INC.**

500 Arsenal Street, Watertown, Massachusetts 02472

Tel: 617-924-1010 ♦ Fax: 617-926-4093

E-mail: [array@genscan.com](mailto:array@genscan.com) ♦ [www.genscan.com](http://www.genscan.com)

Circle No. 9 on Readers' Service Card